JANUARY 15, 1961

AUTOMOTIVE INDUSTRIES

ENGINEERING · MANAGEMENT · PRODUCTION · DESIGN

A CHILTON PUBLICATION

ALUMINUM...

SEE PAGE 55

Front-Runner in Materials Derby

ALSO IN THIS ISSUE

MALLEABLE IRON POSTS NEW GAINS

BOATING AT NEW HIGH IN '60

DESIGN ADVANCES IN MARINE ENGINES

WELDED GEARS FOR TRANSMISSIONS

Aluminum Castings at GM's Central Foundry

Daily production of 1000 blocks and 2000 cylinder heads dramatically illustrates aluminum's penetration of engine market.
Left to right: J. A. Smith, Divisional General Manager and T. R. Wiltse, Plant Manager.

NUMERICAL CONTROL...

A Realistic Appraisal

by A. Francis Townsend
Vice President, Engineering
The Heald Machine Company

At the 1960 Machine Tool Exposition, numerical control emerged as the shining new star on the metalworking horizon. In fact, if you didn't have something numerically controlled to demonstrate, you just weren't in the running.

This subject is one that deserves a realistic appraisal. Is it a "fad" that will not stand the test of time? Or is it a panacea, a cure-all, that will eventually make all manually-operated machines obsolete?

Since Heald offers both numerically controlled and manually operated machines, we can afford to look at the subject objectively. Of this we can be sure—numerical control is here to *stay*. On the other hand, we can be equally sure that it is not the universal solution to all machining problems —and that manual operation will also be around for a long time to come.

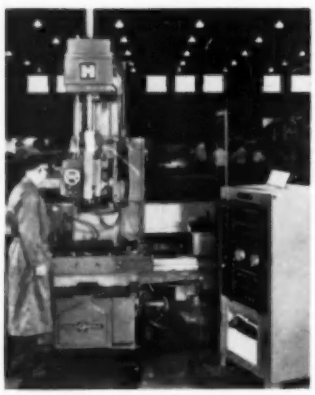
Where to use numerical control is largely a matter of production economics. How far it can be *profitably applied* depends on many factors, including the nature of the workpiece and the operations to be performed. In general, however, numerical control will usually be most advantageous where any of the following conditions are encountered.

1. Where several different setups are required on the same or different workpieces.
2. Where the operations performed are complex in nature.
3. Where manual setup time is relatively high.
4. Where time for tooling design, manufacture and use must be reduced.
5. Where variety and complexity of work require excessive tooling cost.

Properly applied, numerical control offers many profitable opportunities for making substantial cost reductions. Improperly applied, it will be a disappointing investment.

Numerically-controlled Bore-Matics permit contour boring and turning of irregular shapes with higher accuracy and precision than were heretofore obtainable. In routine production, the machine shown here contour turns an aluminum workpiece to ± .0001" of true path.

Your Heald engineer is fully qualified to help you evaluate the economics of numerical control for Borizing, grinding and precision drilling operations. It will pay you to call him in before taking the "plunge."



Numerically-controlled HEALDRILL makes high-precision layout or production drilling **fully automatic** —with tape control of precise hole location as well as selection of speeds, feed rates and tool change indication. A taped program for any workpiece can be stored and reused whenever needed for exact duplication of the most complex drilling operations.

THE HEALD MACHINE COMPANY
Subsidiary of The Cincinnati Milling Machine Co.
Worcester 6, Massachusetts

Circle 101 on Inquiry Card for more data

KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many who may find it useful to review fundamentals from time to time.

Methods of Carburizing Alloy Steels

Carburizing is a means of impregnating the surface of steel with carbon, usually to very limited depths. Its purpose is to provide a hard, wear-resisting "case," or outer shell. Alloy steels, correctly handled, can be case-hardened without sacrificing desirable core properties.

There are three types of carburizing in general use:

Liquid Carburizing—The medium here is a hot-salt bath composed basically of cyanide compounds. The steel is immersed in the bath, the period of immersion depending upon the analysis of the steel and the depth of case desired. Liquid carburizing is a convenient method of producing thin, hard, wear-resisting cases, generally within the depth range of 0.02 to 0.03 in. However, deeper cases may be obtained, the actual depths depending upon economics and end uses.

Gas Carburizing — This method employs a furnace in which a carbonaceous atmosphere is created; i.e., gases that are high in carbon components, or those containing carbon. Steel subjected to gas carburizing can be case-hardened to depths generally ranging from 0.01 to 0.04 in. When quenching takes place immediately after carburizing, distortion can be kept to a minimum.

Pack Carburizing — Where the pack method is used, the parts to be carburized are buried in a container of dry carbonaceous materials. The container is sealed tight to prevent the infiltration of air, placed in a furnace and kept there for eight hours or more, the actual time depending upon the depth of case desired. Pack carburizing is particularly suitable where a deep case is essential (0.06 in. and over), although medium cases in the 0.04-to-0.06-in. range are possible.

This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
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BETHLEHEM STEEL

BETHLEHEM STEEL

Circle 103 on Inquiry Card for more data

How B&W JOB-MATCHED LECTROSONIC* J.I.C. TUBES solve hydraulic fluid line problems

New J.I.C. Standards approve welded carbon steel tubing for hydraulic fluid lines—and B&W makes such tubing—

Five quality control checks—including 100% ultrasonic inspection — help assure you maximum dependability from B&W Job-Matched Lectrosonic J.I.C. Hydraulic Fluid Line Tubing. You get:

- . . . a full range of sizes and dimensional exactness and uniformity — matched to your job in every detail
- . . . controlled mechanical properties — to give ease of fabrication and save you installation time
- . . . long, trouble-free service life — even in the most exacting applications

B&W will be glad to help you select exactly the right tube for efficient, economical service. Call your local B&W District Sales Specialist, or write for Bulletin 435 for full information. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

*Welded Carbon Steel Tubing

B&W

THE BABCOCK & WILCOX COMPANY

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

JANUARY 15, 1961

Passenger Cars • Trucks • Buses • Aircraft • Tractors • Engines • Bodies • Trailers • Road Machinery • Farm Machinery • Parts and Components • Accessories • Production and Processing Equipment • Design • Production • Engineering • Management

VOL. 124 No. 2

Features • • •

▼ Aluminum, Front-Runner in Materials Derby

The use of aluminum in automobiles is expected to reach an all-time high during 1961. The cast aluminum engine, according to recent estimates, will represent an increase of 50 to 80 million lb. Page 55

▼ Malleable Iron Posts New Gains

The average 1961 car uses over 100 lb of malleable castings. On some of the new makes and models, use of malleable iron has reached record levels. Page 60

▼ Plastic Foam Gaskets Used in Chrysler Cars

Applications of polyethylene foam as a gasket material have increased from a half dozen in 1959 and 1960 Chrysler Corp. cars to more than 30 in 1961 models. Page 62

▼ Expenditures on Recreational Boating at All-Time High in 1960

A record dollar volume of $2.525 billion (estimated) was spent at the retail level last year on recreational boating. Page 63

▼ Advances in Design of Marine Engines

The builders of outboard motors and inboard marine engines have refined and improved their products for 1961. Many of the new designs are described and illustrated. Page 66

▼ Machining Aluminum Transmission Case Covers

GMC's Detroit Transmission Division at Willow Run uses three different transfer machines on die-cast aluminum transmission case covers. Page 68

▼ Quality Control in Friction Material Manufacturing

Raybestos-Manhattan, Inc., has initiated precise controls and extensive customer collaboration to produce high-quality friction materials. Page 72

▼ Balancing Blower Fans

Chrysler Corp.'s Airtemp Div. at Dayton, O., is balancing heater and defroster fans on equipment which achieves a 50 per cent saving in time. Page 95

▼ Welded Construction for Cluster Gears

Conventional methods of machining transmission cluster gears were discarded at the Dubuque Tractor Works of Deere and Co. in favor of welded construction. Page 104

▼ 22 New Product Items and Other Features Such as:

Machinery News; Manufacturers' News; Industry Statistics; and Auto-Technics Data Sheets.

. . . continued on next page

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MEMBER SBME Society of Business Magazine Editors

NBP National Business Publications, Inc.

BPA Business Publications Audit of Circulation

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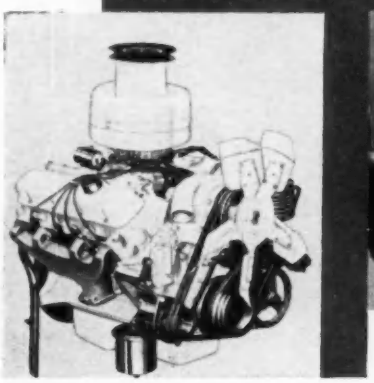

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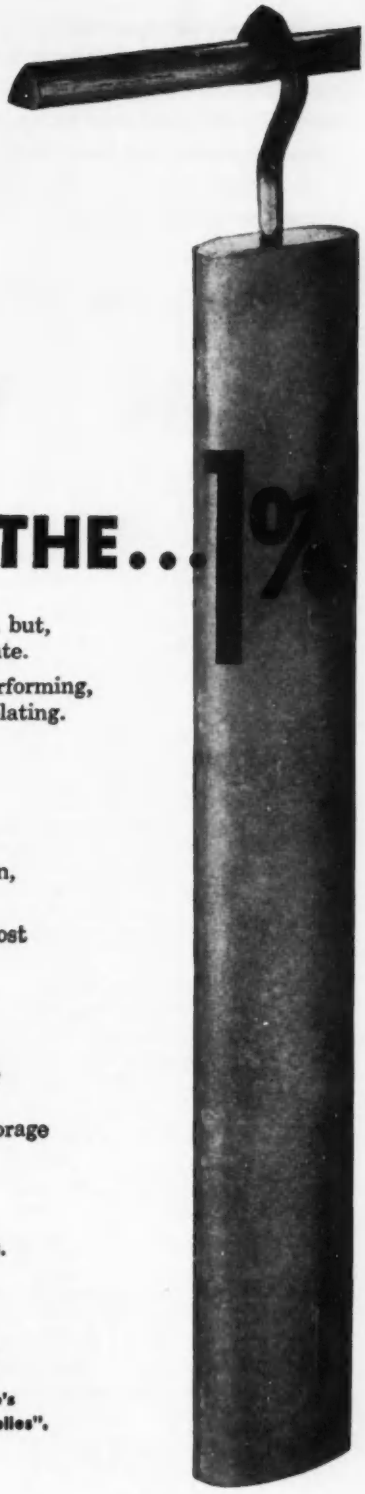

BUYING 99+% NICKEL?

Here's why you should

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Of course, you, as a nickel user, want 99% pure nickel anodes . . . but, it's that 1% that makes the difference between good and bad plate.

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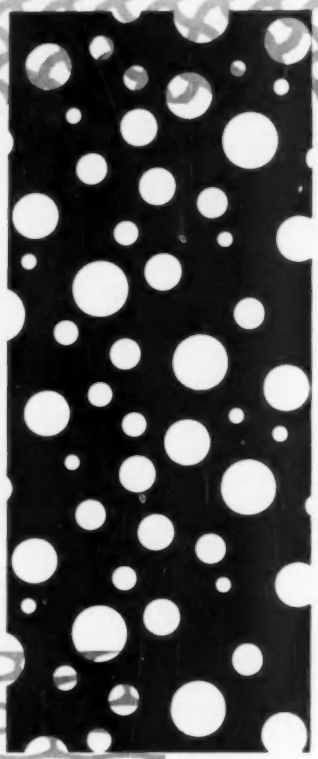
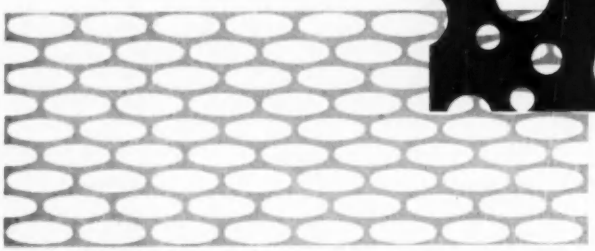
H&K
perforated materials

Passage or control of air, sound, light or fluid . . . decorative concealment . . . component protection . . . eye catching, sales-building beauty—if your product requires any or *all* of these features, you'll find the design and functional versatility you need in the Harrington & King line of perforated materials. Just four of H & K's new patterns are illustrated here. There are many more contemporary and traditional designs, all available in steel sheets for shipment from stock.

And there is also a vast selection of additional patterns and open areas which can be custom fabricated from existing dies. H & K can perforate practically any material. May we put our more than 75 years of experience to work for you?





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CALENDAR

OF COMING SHOWS AND MEETINGS

29th Annual Meeting, Institute of the Aeronautical Science, New York ..... Jan. 23-25

12th Annual Plant Maintenance & Engineering Show, Chicago ..... Jan. 23-26

Society of Plastic Engineers, Inc., 17th Annual Technical Conference, Washington, D. C. .... Jan. 24-27

20th Annual Convention, Truck Trailer Mfg. Assoc., Hollywood, Fla. ..... Jan. 29-Feb. 1

American Society of Testing Materials, Committee Week, Cincinati ..... Jan. 30-Feb. 3

The Society of the Plastic Industries, Inc., 16th Reinforced Plastic Div. Conference, Chicago ..... Feb. 7-9

American Foundrymen's Society, Wisconsin Regional Conference, Milwaukee ..... Feb. 9-10

Malleable Founders Society, Semi-Annual Meeting, Cleveland .. Mar. 1-2

American Society of Mechanical Engineers, as Turbine Power Div., Co-Sponsored by the Dept. of Defense, 6th Annual Gas Turbine Conference & Show, Washington, D. C. ..... Mar. 5-9

Material Handling Institute, Spring Meeting, Chicago ..... Mar. 7-9

Instrument Society of America, 11th Annual Conference on Instrumentation for the Iron and Steel Industry, Pittsburgh .. Mar. 8-10

The Steel Founders Society of America, Annual Meeting, Chicago ..... Mar. 11-14

The American Society of Mechanical Engineers, Aviation Conference, Los Angeles ..... Mar. 12-16

American Society for Metals, Western Metal Exposition, Los Angeles ..... Mar. 20-24

23rd Annual American Power Conference, Sponsored by Six National Engineering Societies, Chicago ..... Mar. 21-23

Spring Technical Meeting, Pressed Metal Institute, New York. Mar. 22-24

Management Engineering Conference, American Society of Mechanical Engineers, Society for the Advancement of Management, New York City ..... Apr. 6-7

43rd Anniversary National Truck, Trailer & Equipment Show, Los Angeles ..... Apr. 13-15

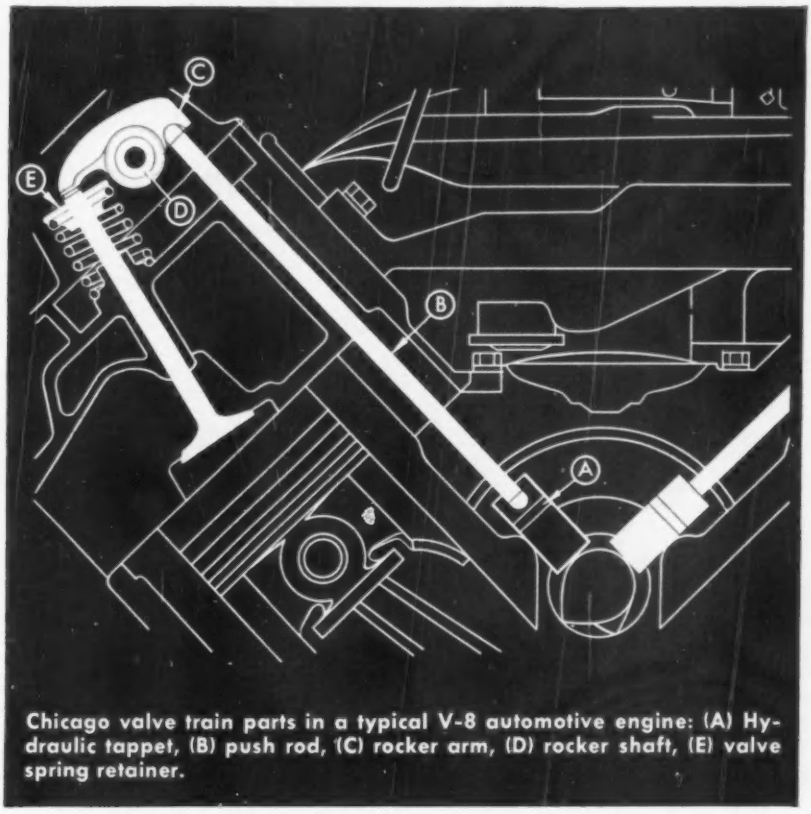
American Welding Society, 42nd Annual Convention and Welding Exposition, New York .. Apr. 10-21

18th Annual Western Section Conference, Society of the Plastics Industry, Inc., Coronado, Calif. ..... Apr. 20-21

65th American Foundrymen's Society Exposition, San Francisco ..... May 8-12

American Society of Tool & Manufacturing Engineers, 1961 Engineering Conference & Exhibit, New York ..... May 22-26

For all engines - - -



Chicago valve train parts in a typical V-8 automotive engine: (A) Hydraulic tappet, (B) push rod, (C) rocker arm, (D) rocker shaft, (E) valve spring retainer.

Passenger cars

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Here at Chicago you'll find a single source for everything you need in valve gear. These specialized facilities are solving problems and saving money for leading engine manufacturers . . . and can do the same for you.

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Manufacturing—Chicago is a leading manufacturer of valve train parts. Our complete line includes precision-made hydraulic and mechanical tappets; push rods in both lightweight tubular and solid styles; valve adjusting screws including new self-locking screws that cut assembly costs; valve spring retainers; rocker arms and rocker shafts.

Testing—we have complete laboratory and engine testing facilities.

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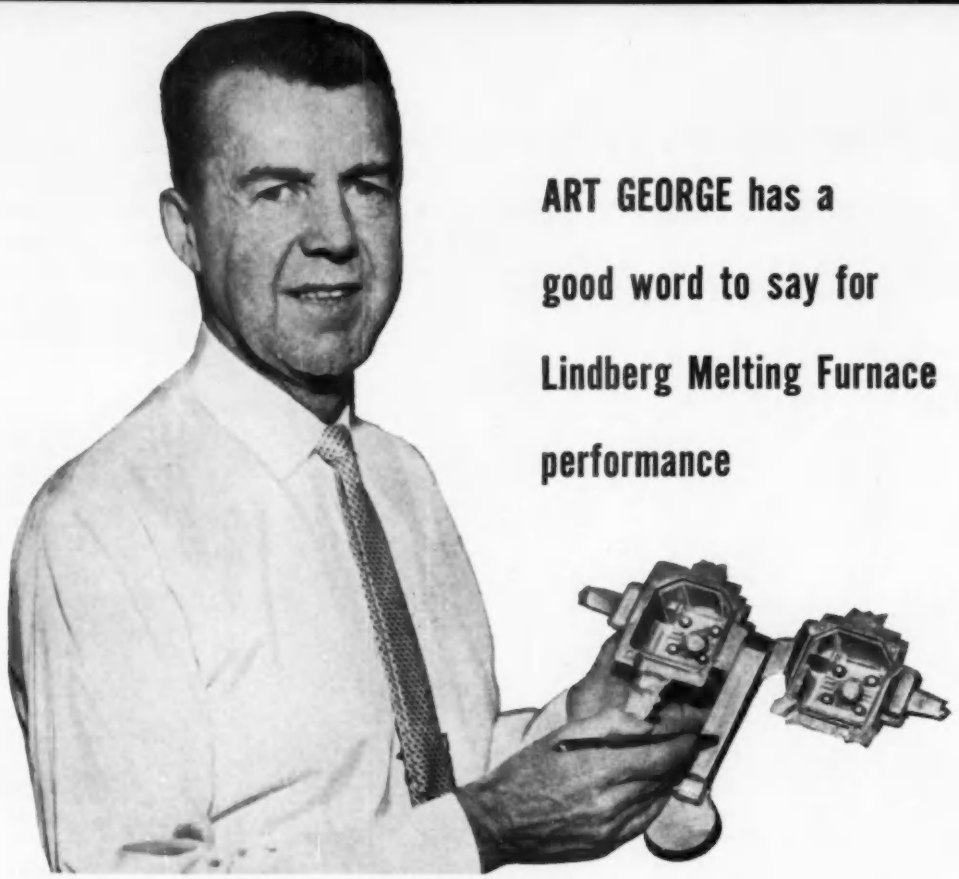


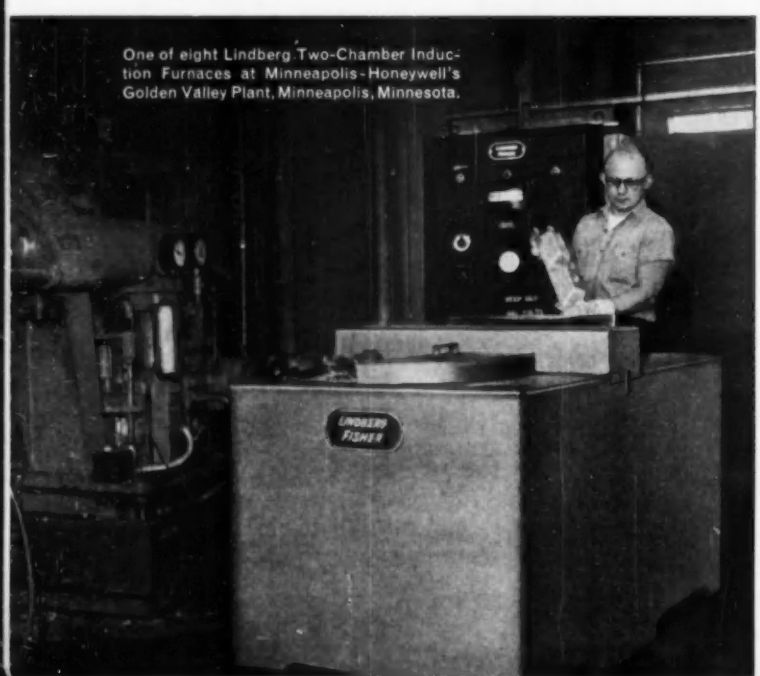
ART GEORGE has a good word to say for Lindberg Melting Furnace performance

QUOTE

Mr. Art George, Senior Production Engineer, Golden Valley Plant, Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

"Our installation of eight* Lindberg-Fisher Two-Chamber Induction Melting and Holding Furnaces has given remarkable service for more than four years. In this period, with the help of a well executed Honeywell maintenance program, the installation has been unusually trouble-free. Only one of the eight furnaces has required relining over this long period. Handling more than 1,000,000 pounds of aluminum and zinc annually, the installation has unfailingly provided the consistently high quality of metal our precision instruments require."

**Altogether, 44 Lindberg Furnaces are in operation in various Honeywell plants.*



One of eight Lindberg Two-Chamber Induction Furnaces at Minneapolis-Honeywell's Golden Valley Plant, Minneapolis, Minnesota.

These eight Lindberg-Fisher Induction Furnaces melt and hold aluminum and zinc for die casting gas valve housings and other component parts. They are located at the die casting machines where ingot and scrap can be melted and held at the desired casting temperature in one convenient unit. Magnetic fluxing and stirring insures uniform temperatures and consistently clean metal.

In any production process where aluminum needs heat there is Lindberg equipment to apply it most economically and efficiently. Furnaces for melting and holding, casting stations, re-melting or heat treating are available in all capacities, electric or fuel fired. Get in touch with your Lindberg Field Engineer (see your classified phone book) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2491 West Hubbard St., Chicago 12, Illinois.

Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also, Lindberg plants in Argentina, Australia, England, France, Italy, Japan, South Africa, Spain, Switzerland and West Germany.

LINDBERG
heat for industry

Gasket engineering

LATHE-CUT RINGS vs. MOLDED O-RINGS

Lathe-cut cork-and-rubber rings are compressible. They often permit wider tolerances in the flanges . . . opening the way for worthwhile savings in machining time. And their initial cost is lower.

If you now use molded rubber O-rings, chances are you can reduce costs considerably by changing to lathe-cut rings of Armstrong cork-and-rubber materials. At the same time, it may be possible to effect savings in machining time and inventory costs. Here's why.

A molded O-ring can cause sealing problems if the ring is not exactly the right size in cross section. If the ring is too small, it will not seal. If it is too large, it will prevent flange contact.

The reason, of course, is that rubber is non-compressible. Under pressure it flows laterally, but does not decrease in volume. As a result, rubber O-rings must be made to very close tolerances to allow a perfect fit between flanges.

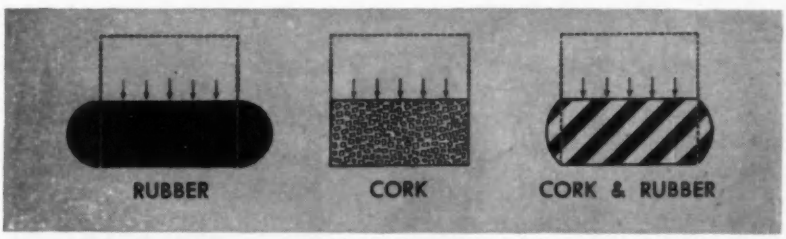


Figure 1. Rubber is non-compressible. Under pressure it flows laterally—does not decrease in volume. Cork is truly compressible. It exhibits no lateral flow under pressure. Cork-and-rubber gives controlled compressibility. Lateral flow can be controlled by varying the composition of the material.

Lathe-cut O-rings of cork-and-rubber compositions offer a number of advantages over molded O-rings. In such compositions, the compressibility can be controlled. The material can be made nearly as incompressible as rubber. The per cent of compression for cork-and-rubber rings may range from 20% to 33%.

This means that wider tolerances are permissible with cork-and-rubber rings, since the lateral flow can be controlled. The result may be a savings in machining time. In some cases, a reduction of inventories may be possible because one size of cork-and-rubber ring may work where two or more molded O-ring sizes might be required. These economies, of course, are in addition to the lower first cost of lathe-cut rings.

Cork-and-rubber O-rings give the imperviousness of rubber, since the rubber binder encloses each cork particle in a continuous matrix. The temperature limits of cork-and-rubber materials vary with the composition of the material and the contained fluids to which they are exposed. In general, continuous operating temperatures should not exceed 300° F.

The solvent resistance of cork-and-rubber compositions is comparable to straight synthetic rubbers of corresponding base polymers. For example, cork-and-chloroprene-type synthetic rubber is normally used with lubricating oils and for general purpose applications where some swell is desired or can be tolerated.

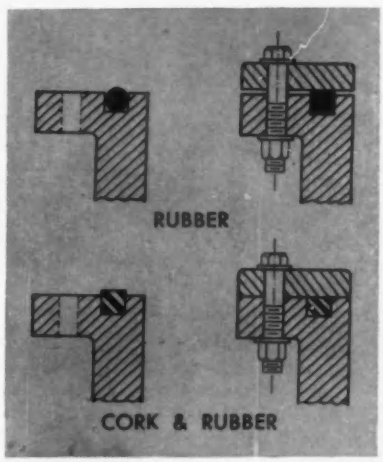


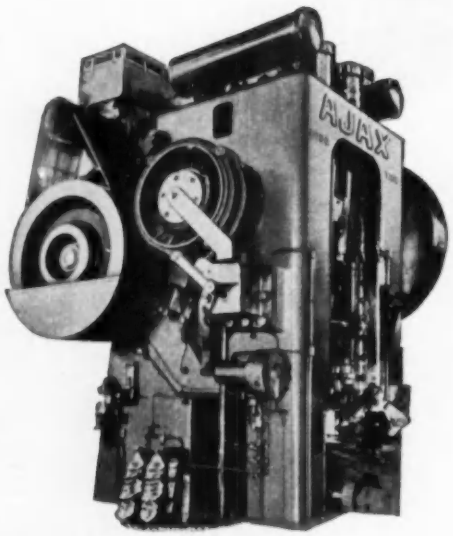
Figure 2. If O-rings made of incompressible rubber are slightly oversized, the joint will not close. Compressible cork-and-rubber rings may be cut to full channel width and from 20% to 33% deeper than the channel.

Cork-and-nitrile-type synthetic rubber provides good gasoline and aromatic-solvent resistance and has less tendency to swell or stick on metal surfaces.

If you have a problem with O-rings, perhaps we can help you. Send complete details of your application to us. And, for a free copy of our Gasket Design Manual, containing detailed information on gasket design and selection, write Armstrong Cork Company, Industrial Division, 7101 Imperial Avenue, Lancaster, Pennsylvania.

Armstrong GASKET MATERIALS

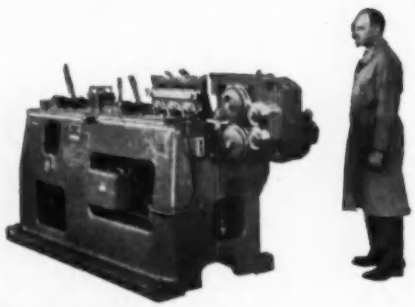
the Ajax line
OF METAL WORKING MACHINES



"HIGH SPEED" FORGING PRESSES

Built in 13 sizes from 300 to 8000 tons capacity. Ajax Presses are built with massive, solid, mill housing-type steel frames. Rigid frames assure excellent alignment and accurate die match for the production of uniform and accurate forged parts.

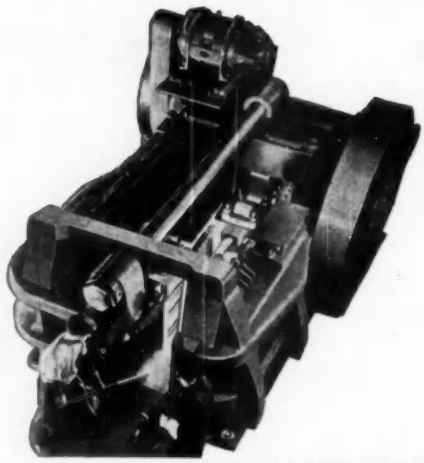
Write for Bulletin 75-C



AJAX-HOGUE WIRE DRAWERS

An attachment for any size cold header and parts former. It cold draws wire in a straight line from hot-rolled stock instead of cold-drawn wire. You save the difference in cost of material and at the same time produce the highest quality cold-headed parts.

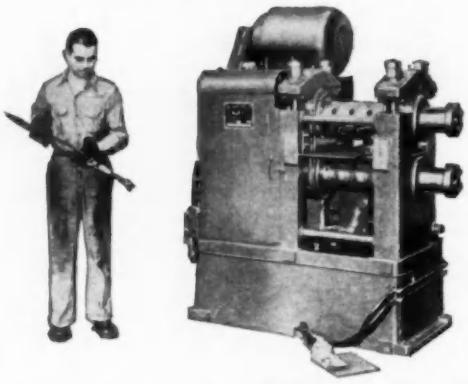
Write for Bulletin 111-B



"AIR CLUTCH" FORGING MACHINES

Choose from a complete line of forging machines—Sizes 1" to 12" to make the forged parts you need . . . Transmission gears —Flanged axle shafts—Crankshaft flanges—Jet Blade Blanks—Implement & Tractor forgings. There's an Ajax Forging Machine for every field of upset forging in industry.

Write for Bulletin 65-D



"WIDE ADJUSTMENT" FORGING ROLLS

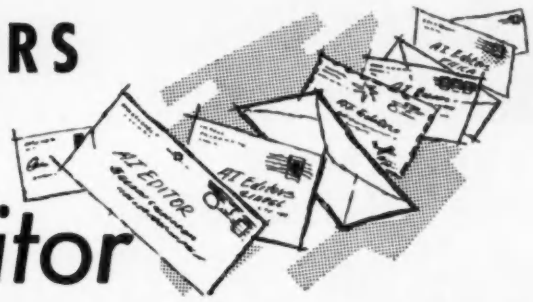
Pre-roll your forging blanks for metal saving—longer die life—and better fibre flow. Ajax Rolls are available in 7 sizes to pre-roll forging blanks ranging from connecting rod blanks to the largest propellers. Extension shafts with overhanging dies permit rolling long work.

Write for Bulletin 91-B

SERVING THE FORGING INDUSTRY SINCE 1875

THE Ajax MANUFACTURING COMPANY
1441 CHARDON RD. CLEVELAND 17, OHIO
CHICAGO OFFICE: 110 S. DEARBORN STREET CHICAGO 3, ILLINOIS
WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.

LETTERS to the Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

PURCHASING

I have read with interest your advertisement in the December issue of Industrial Marketing in which the highlights of an article by Mr. William G. Sutter titled "How to Sell the Budd Company" is given. These are very interesting points and I would like to have three copies of the full article as it appeared in the August 15 issue of AUTOMOTIVE INDUSTRIES.

Robert C. Hills
Robert C. Hills Associates
New York, N. Y.

● *Most happy to oblige. Reader Hills might be interested in knowing that AI has published a series of special reports on purchasing practices in the automotive industry. Available under one cover as Engineering Report No. 3, price: $1.00—Ed.*

WELDING

Would it be possible to receive a reprint from your magazine entitled, "Welding—Primary Production Method for Motor Vehicles."

M. E. Fallek
Manager, Market Research
Smith Welding Equipment Corp.
Minneapolis, Minn.

● *Roger. Reprint requested is a 28 page report covering five separate feature articles on welding —Ed.*

AI TABLOID

As a reader of AUTOMOTIVE INDUSTRIES, I like very much your AI Tabloid section. However, it would be helpful if you could supply some information regarding where the reports checked below can be obtained (Air Force Report on a simple and precise method of calculating detonation parameters for gaseous mixtures, two Navy Reports on the effectiveness of water mist against ignition from radiant heat).

● *Information is on the way — Ed.*

ELECTRONIC DATA PROCESSING

I can only say that your treatment of the Hastings story in the December 1 issue of AUTOMOTIVE INDUSTRIES was just great!

Dave Love
International Business Machine
Data Processing Div.
White Plains, N. Y.

● *Look for a roundup story on EDP in the automotive industry to be published in the near future—Ed.*

AUTOMATION

We are interested in having reprints of your editorial item (Automation News Report) on page 69 of your recent issue. Would you please give us the rate for 5000 reprints of this page.

James G. Huber
Thompson-Ramo-Wooldridge
Beverly Hills, Calif.

PRESENTATION COVER

Thanks very much for the mounted presentation copy of your cover featuring our weld testing operation, and, of course, for the fine treatment of the story itself.

The mounted cover is a very interesting piece and I know our Stamping Division people will be very proud of it.

James A. Baubie
Director, Public Relations
Chrysler Corp.
Detroit, Mich.

MADE FOR LIGHTNING FAST APPLICATION

STOCKED FOR SUDDEN SERVICE

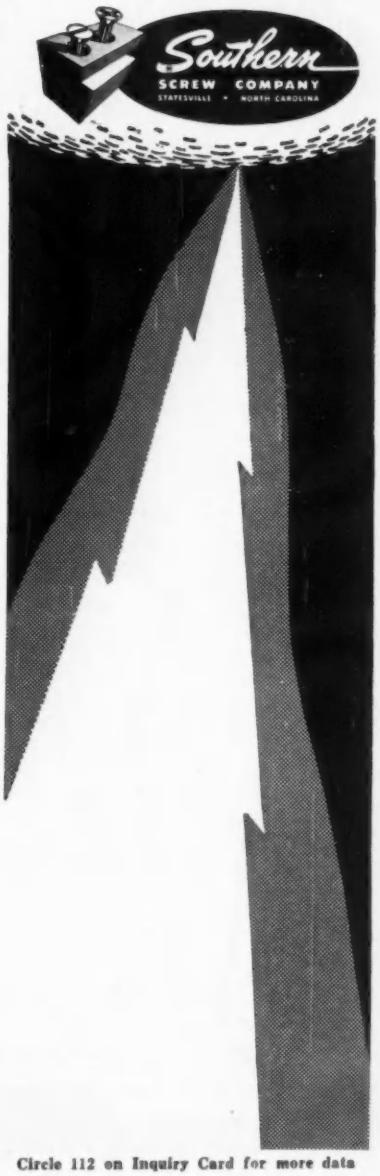
Southern Screws are USA-made with USA-made materials, by fastener specialists who know that burr-free heads and sharp threads mean faster, more profitable assembly.

If you have a fastening assignment on which you would like to save time, money and labor, contact your Southern Screw distributor for fast service. Or write direct to: Southern Screw Company, P. O. Box 1360, Statesville, North Carolina.

Manufacturing and Main Stock in Statesville, N. C.

Warehouses: New York • Chicago • Dallas • Los Angeles

A, B, C, & F Tapping Screws • Machine Screws & Nuts • Stove Bolts • Drive Screws • Continuous Threaded Studs • Carriage Bolts • Hanger Bolts • Dowel Screws • Wood Screws



Circle 112 on Inquiry Card for more data

There's No Substitute For EXPERIENCE

OURS IS TIME-PROVED

LINCOLN WELDERS
DIVCO TRUCKS
• OLIVER FARM TRACTORS • OSHKOSH TRUCKS • ONAN GENERATORS • OWENS YACHTS • FOUR-WHEEL-DRIVE TRUCKS •
• LEROI ENGINES • TREN SHOVELS • MANISCHEWITZ CRANES • CONTINENTAL ENGINES • WISCONSIN ENGINES • KOHLER GENERATORS • JOHN DEERE COMBINES • J. I. CASE TRACTORS • YALE & TOWNE TRUCKS •
• READY POWER GENERATORS • SCHRAMM AIR COMPRESSORS • CHRIS-CRAFT ENGINES • FORD L-P GAS TRACTORS •
GRAY MARINE ENGINES
ALLIS-CHALMERS
MASSEY-FERGUSON • AUTOMATIC LIFT TRUCKS • CLARK LIFT TRUCKS • DUPLEX TRUCKS • CHECKER CABS • CATERPILLAR TRACTORS • DIAMOND T TRUCKS • PALMER MARINE ENGINES
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UNIVERSAL MARINE ENGINES • AMERICAN LAFRANCE FIRE ENGINES
RED TRUCKS • MACK TRUCKS • GRAVELY TRACTORS • TOWMOTOR LIFT TRUCKS • GENERAL MOTORS TRUCKS • CHRYSLER MARINE ENGINES • FRANK HOUGH TRUCKS • WAUKESHA ENGINES
ZENITH® has designed and built carburetors for more different types of equipment than any other manufacturer.
Carburetors and fuel filters for trucks, tractors, buses, fire engines, boats, stationary engines and off-the-road equipment. Put our experience on gasoline carburetors and LP Fuel Systems to work on your problems. Write Zenith Carburetor Division, 696 Hart Avenue, Detroit 14, Michigan.
THE Bendix CORPORATION
Zenith Carburetor Division
696 HART AVENUE
DETROIT 14, MICHIGAN

Circle 113 on Inquiry Card for more data

"RoadRangers boost our profits, and we can prove it," says John N. Hall, President, Hall's Motor Transit Company. Operating figures show that RoadRangers give

13.9% savings on fuel . . . 10.8% reduction in trip time

Hall's Motor Transit Company, Sunbury, Pa., expects to gross over $17-million in 1961. To achieve this goal, Hall's over-the-road fleet will log about 15 million miles and haul more than a billion pounds of freight.

"With an operation this size," says President John N. Hall, "we need to keep detailed figures on the performance and reliability of every unit in our fleet. Comparative studies prove that Fuller RoadRangers have been responsible, in large measure, for our trouble-free operation, substantial fuel savings and overall efficiency."

Nearly 93% of Hall's road tractors are Internationals equipped with Fuller RoadRangers. 286 of the units are R-200s with R-46 8-speed RoadRangers and 23 are RD-225 Diesels with R-96 10-speed RoadRangers.

Hall's RoadRanger-geared tractors average 13.9% better fuel mileage than rigs using the same engine but with transmissions of another manufacturer. Fuller-geared trucks cut trip time an average of 10.8%.

Maintenance figures have been impressive, too. Says Mr. Hall, "Road failures have been reduced to an absolute minimum, and we have several RoadRanger-equipped tractors with over 125,000 miles that haven't cost us a cent in unscheduled maintenance. The RoadRanger is truly an outstanding transmission."

FULLER TRANSMISSION DIVISION
EATON MANUFACTURING COMPANY
KALAMAZOO, MICHIGAN

Sales & Service: West. Dist. Branch, Oakland 6, Cal. • Southwest Dist. Office, Tulsa 3, Okla. • Automotive Products Co., Ltd., Brock House, Langham St., London W.1, England, European Rep.

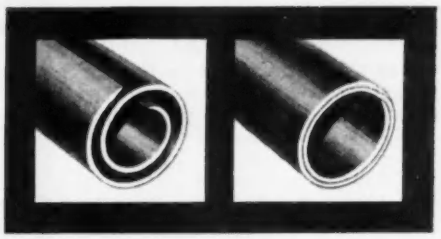
Circle 116 on Inquiry Card for more data

Bundy can mass-fabricate practically anything

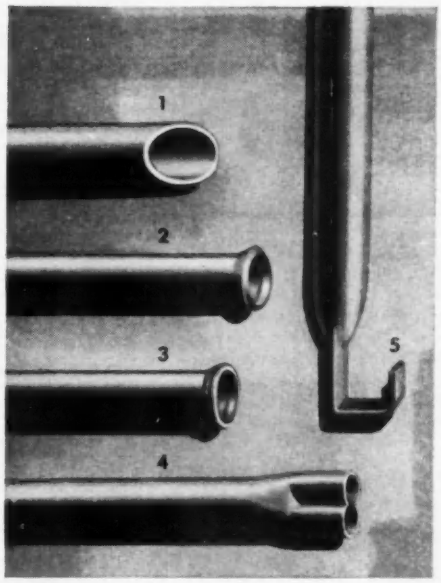
And this mass-fabrication experience can help you. Whatever kind of small-diameter steel tubing you are now using—or plan to use—Bundy can probably make it better . . . in quantities of thousands or millions. How? By making your part from Bundyweld®, the steel tubing that's rated tops in safety in the automotive industry. Bundyweld tubing meets ASTM-254; Govt. Spec. MIL-T-3520, Type III. And by applying years of problem-solving experience to your tubing problem, Bundy engineers can often find short cuts that shave costs in mass-fabrication. Let Bundy experience help you. Write: Bundy Tubing Company, Detroit 14, Michigan.

BUNDY TUBING COMPANY • DETROIT 14, MICH. • WINCHESTER, KY. • HOMETOWN, PA.

World's largest producer of small-diameter tubing. Affiliated plants in Australia, Brazil, England, France, Germany, Italy, Japan.



Bundyweld, double-walled from a single copper-plated steel strip, is metallurgically bonded through 360° of wall contact. It is lightweight and easily fabricated... has remarkably high bursting and fatigue strengths. Sizes available up to ⅝" O. D.



Bundy can mass-fabricate small-diameter steel tubing to solve a wide variety of design problems. The Bundyweld steel tubing shown above is: (1) sheared, (2) flared, (3) double-upset, (4) bifurcated, and (5) closed with flattened end.

BUNDYWELD® TUBING

Circle 115 on Inquiry Card for more data

Remote unit reports progress Located in the Sales Department, this remote inquiry station has a direct line to the RAMAC unit on the floor below. When a customer order number is keyed into this station, an up-to-date status report is *immediately* printed out on the automatic typewriter.

Keeps an eye on production Final assembly and testing of these Cramer timing controls are typical of the many precision operations carried on in the plant. Each involves a large number of small parts which are produced, stocked and assembled under MOS control.

IBM®

TOTAL MOS INSTALLED

Gets information fast—Mr. J. T. Kennedy, Treasurer, checks with operator of the IBM RAMAC 305 Data Processing System—the heart of Cramer's Management Operating System. Disk file at rear stores and continually updates all operating records—each immediately available on demand.

Management Operating System at Cramer Controls Corporation

...improves delivery and reduces inventory
...with an increase in sales of 60%

Cramer Controls Corporation, Centerbrook, Connecticut, manufactures precision timers and control instruments. They consider their IBM Management Operating System a *highly profitable investment.*

To this progressive company, with 330 employees and annual sales of around $4 million, IBM data processing is an essential part of management control. It has helped them cut costs...reduce inventories... improve profit margins...speed customer service. And it has done all this while handling a 60 per cent increase in sales and reducing delivery time by five full days.

Built around the IBM RAMAC® 305, the system at Cramer uses modern data processing techniques to *inter-relate* the six major control functions: Sales Forecasting, Materials Planning, Inventory Management, Plant Scheduling, Work Dispatching & Operations Evaluation.

How MOS works to cut costs

Complete data for each major operating function is stored in your data processing system. There, past and present sales trends and forecasts are combined to produce a more complete "finished product" plan which automatically...

- determines material requirements
- checks these requirements against inventories
- allocates stocks to assembly needs
- polices inventories for under- or over-stocked items
- initiates stock-replenishing orders as needed

The sequence continues through scheduling, dispatching and operations evaluation. Continually updated cost and performance figures keep management informed of every phase of production.

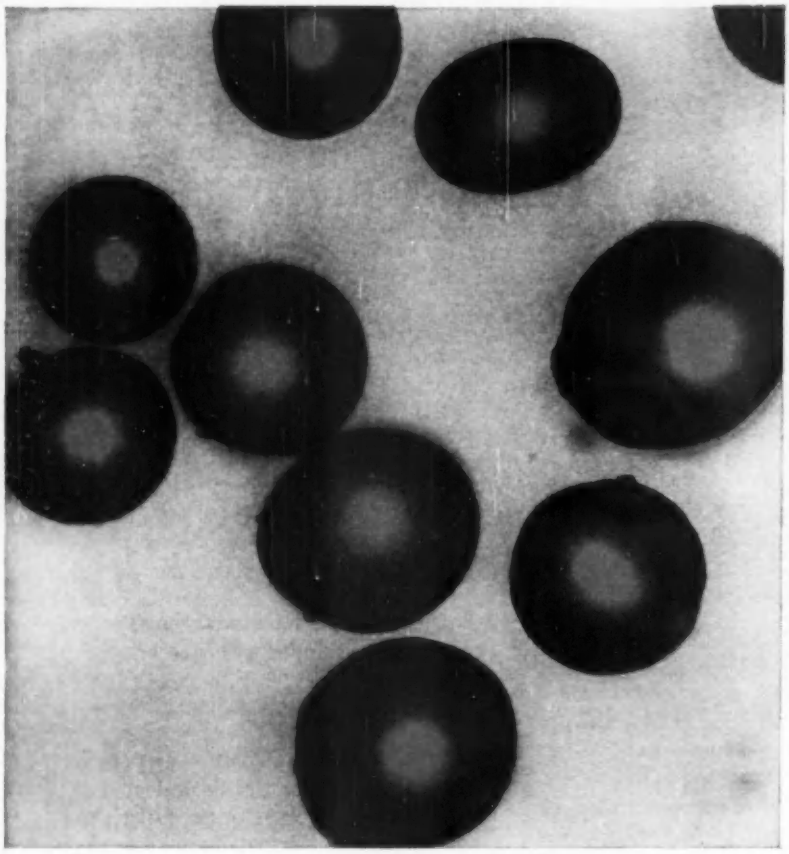
Any change entered into the system is automatically reflected in all other control data. The compensation is made according to a prearranged plan—*your* plan—so that all controls are working toward your *current* objectives.

MOS offers comprehensive control

Only with the total approach provided by MOS can you get such coordinated effort, such complete information, such tight operational control. Only with MOS can you study, *in advance* the effect of decisions yet to be made. For more information, call your local IBM office.

IBM® DATA PROCESSING

30 MILLION OF THESE JET-FORMED SPHERES IN EVERY INCH OF BEARING SURFACE!



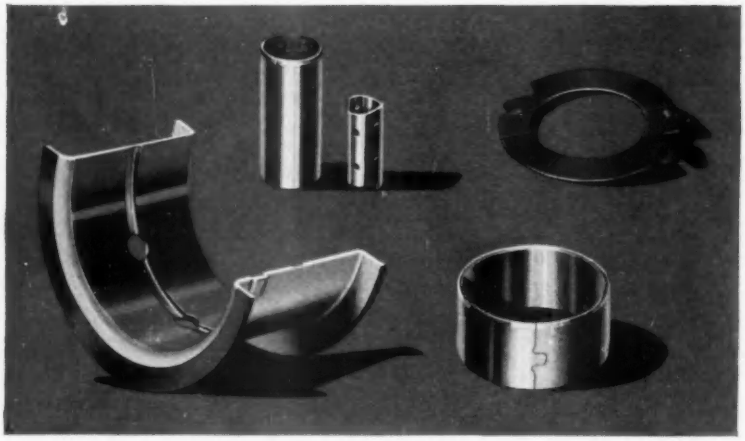
JET PROCESS BLASTS MOLTEN ALLOY INTO UNIFORM PARTICLES . . . so small that thirty million will form a thin layer only one inch square! This sintered layer is the bearing surface of Federal-Mogul sleeve bearings.

Molten copper-lead, alloyed to exact specifications, is poured into a special inert-atmosphere reaction crucible. Here it's blasted by a high-speed fluid jet to form the dense powder shown at left.

Because of the uniform particle size of this powder, the bearing surface of each F-M copper-lead sleeve bearing has precisely the same alloy composition and high adhesion to the steel backing as every other F-M bearing of the same alloy type!

YOU CAN SEE THE CONSISTENT SIZE in the photomicrograph. What you *can't* see is the consistent alloy composition which produces uniform bearing properties and performance in any alloy type.

Federal-Mogul makes engine bearings for every condition of speed and load. You can select from among five different sintered copper-lead alloys, all permanently bonded to precision-formed steel backing. Our Engineering Department is available to you for consultation or recommendations on bearing design and application. For more information, write Federal-Mogul Division, 11037 Shoemaker, Detroit 13, Michigan.



A COMPLETE LINE! Steel backed bearings with a selection of many different alloys for virtually any bearing application—Plain and bimetal bushings in bronze, steel or aluminum. Precision thrust washers in solid bronze, or sintered alloys on steel (one or both faces). Rolled split spacer tubes in steel, aluminum or stainless.

FEDERAL-MOGUL

sleeve bearings
bushings-spacers
thrust washers

DIVISION OF
FEDERAL-MOGUL-BOWER
BEARINGS, INC.

Circle 117 on Inquiry Card for more data

No rattles, no squeaks, no wind noises in this car window.

That's the kind of silence you install with Schlegel woven pile liner.

This thick pile runs uniform through the length of the glass channel. It smothers noises before they start.

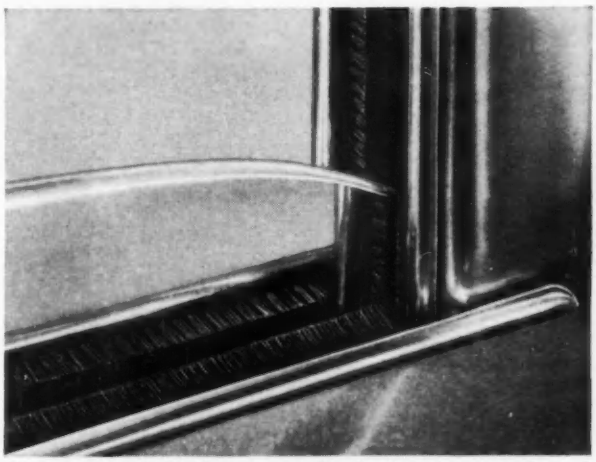
It's a resilient pile. It hugs the surface of the glass tightly—but not so tightly that it restricts window movement.

It's a protective pile. It effectively seals out dust, wind and moisture.

And it's a permanent pile. Each individual strand of pile yarn is interlocked with the woven fabric backing. Thousands of opening and closing actions will not affect this pile. Schlegel pile is a natural seal designed to retain its consistency under all conditions.

Silence? Of course. With proper resilience, density and pile height, a Schlegel woven pile will satisfy the most critical design engineer—but, most of all, dealer and customer satisfaction is assured.

Like to install silence in your automobile windows? Specify Schlegel woven pile in your glass run channels and weatherstripping. They've been used in the quieter cars for decades.



Glass moves friction-free, wet or dry, in this glass run channel with Schlegel woven pile liner.

Schlegel

SERVING THE AUTOMOTIVE INDUSTRY

SCHLEGEL MANUFACTURING COMPANY

1555 Jefferson Rd., Rochester 23, N.Y. In Canada, Oakville, Ont.

Circle 118 on Inquiry Card for more data

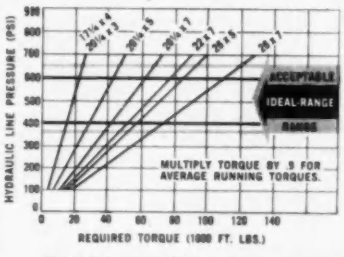
B.F.Goodrich

You can select Hi-Torque brakes in standard sizes and mountings for your heavy-duty vehicles

B.F.Goodrich Hi-Torque brakes are now available in seven basic sizes, from 17¼″ x 4″ to 26″ x 7″, with a variety of mounting designs. Brake actuation can be provided by either air-over-hydraulic, or direct hydraulic power. Thus you can use these brakes in your vehicles with a minimum of design change.

Hi-Torque brakes are now supplied as original equipment on a wide range of heavyweight vehicles: big dump trucks, tractor-scrapers, coal haulers, mine trucks, and other special vehicles. They provide up to 125,000 foot pounds of braking torque per brake in a smaller sized "package" than any other brakes. Hi-Torque brakes cut stopping distance approximately in half, compared to conventional two-shoe brakes tested on identical vehicles and loads.

For complete technical information, call or write *B.F.Goodrich Aviation Products, a division of The B.F.Goodrich Company, Dept. AI-1, Troy, Ohio.*



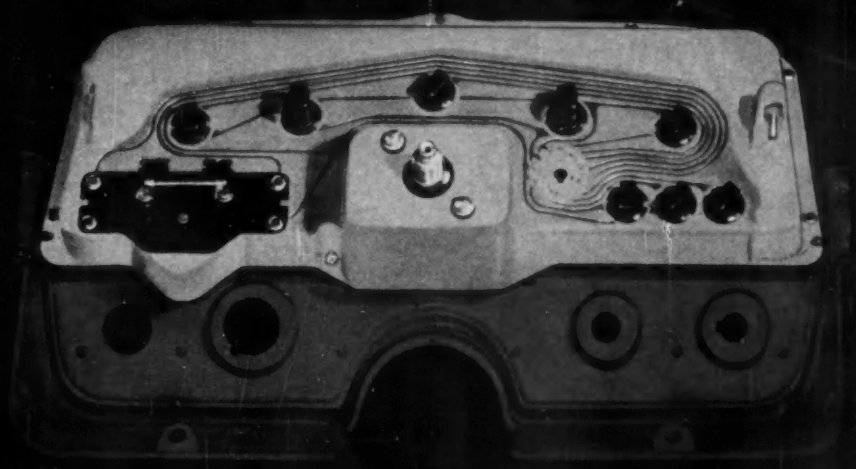
Typical data available on pressure-torque characteristics helps you in selection of the right Hi-Torque brakes for today's growing vehicle loads.

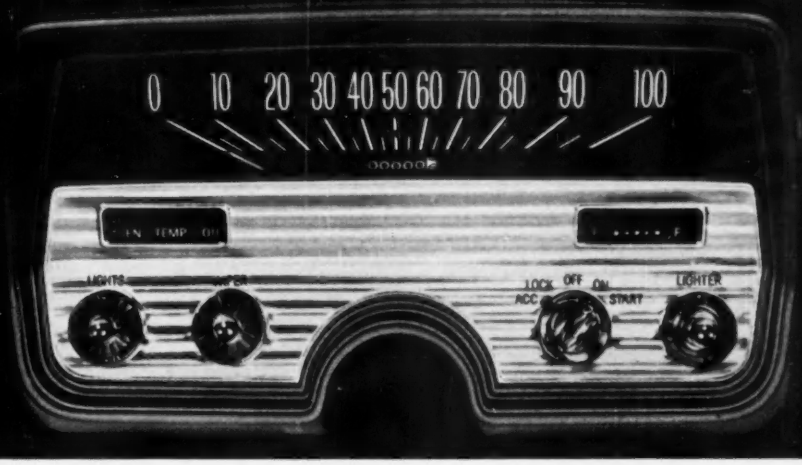
B.F.Goodrich Hi-Torque brakes

Circle 119 on Inquiry Card for more data

Circle 120 on Inquiry Card for more data

Naugatuck KRALASTIC
THE ORIGINAL ABS RESIN





Revolutionary new instrument cluster housing is made of **KRALASTIC**

The first complete instrument cluster housing to be made of plastic is now used by one of the nation's leading automobile manufacturers in all models of one of its new series. And look what KRALASTIC® offers!

1/5 the weight! These new KRALASTIC housings are 7 to 8 pounds lighter than those made with conventional materials, yet are tougher too!

What's more, they are molded to more intricate shapes, impractical with metals. They are rust-proof, sound-deadening, always warm to the touch. They have excellent dimensional stability, even at elevated interior temperatures exceeding 200° F. They provide better adhesion of the seven different acrylic lacquers used to match the cars' interiors. Chipping and marring are minimized, resulting in less touch-up during assembly. Hand-burring and finishing as with metal counterparts is materially reduced.

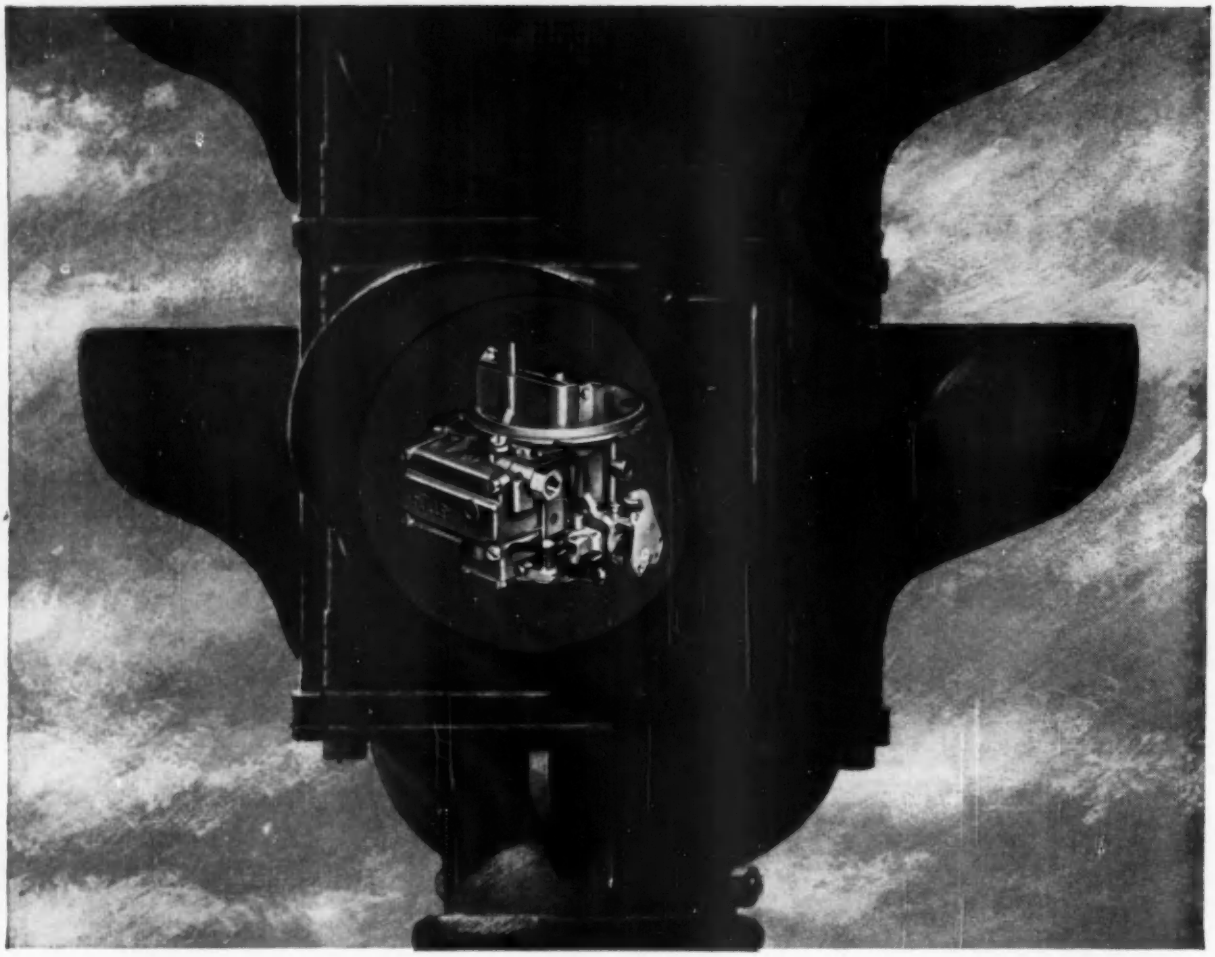
Most important, they have their own instrument wiring built into them, in the form of printed circuits. The single wiring plug is simply snapped into place to make contact with the circuitry printed on the back of the panel. Individual wires to generator, oil, temperature, hi-beam and turn arrow indicators, gas gauge, and illuminating lights are eliminated. Manufacture, shipping and service are simplified as never before. Reliability is brought to an entirely new high.

And there's lots more to come from KRALASTIC, the original ABS plastic. With its unique combination of desirable properties, KRALASTIC is the key to a whole new series of design-engineering improvements, not only in automobiles but in products by the hundreds. Look into it.

United States Rubber
Naugatuck Chemical Division
148K ELM STREET
NAUGATUCK, CONNECTICUT

KRALASTIC RUBBER-RESINS • **MARVINOL** VINYLS • **VIBRIN** POLYESTERS

Akron · Boston · Chicago · Gastonia · Los Angeles · Memphis · New York · Philadelphia · CANADA: Naugatuck Chemicals · Elmira, Ont. · Cable: Rubexport, N.Y.



What happens when the light turns GREEN?

A foot instinctively touches the accelerator. The idling engine springs to life, and the car moves smoothly ahead. It seems so simple, yet literally years were required to design a Holley Carburetor to deliver the exact fuel-air mixture required for instant response when the light turns green, and maximum performance and economy under all conditions.

The ability to design and manufacture intricate carburetors to the specifications of each engine and vehicle is the reason why so many of today's automobiles and trucks have Holley Carburetors as *original equipment*. They are the latest additions to a long, distinguished parade of vehicles for which Holley has supplied over 65,000,000 carburetors.

Holley Carburetors and Ignition Equipment maintain the Holley reputation for precision quality and dependable performance.

HOLLEY Carburetor Co.

Researchers and Developers
in Three of America's
Most Important Industries

®REGISTERED TRADEMARK

11955 E. NINE MILE ROAD, WARREN, MICHIGAN

I-34

AUTOMOTIVE DIVISION . AIRCRAFT DIVISION . ELECTRO-MECHANICAL DIVISION

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#1 Piston choice of Diesel Engine Builders KEEPS ENGINES POWERFUL LONGER—AT LOWER COST

BOND-O-LOC

Exclusively DOUBLE BONDED "Ni-Resist" IRON TOP RING SECTION

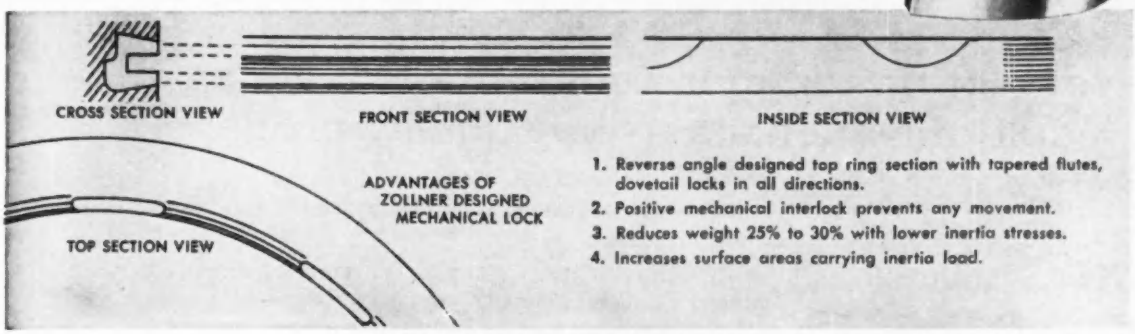
METALLURGICALLY A1-Fin Process

MECHANICALLY Zollner Lock

Design adaptable to any type pistons

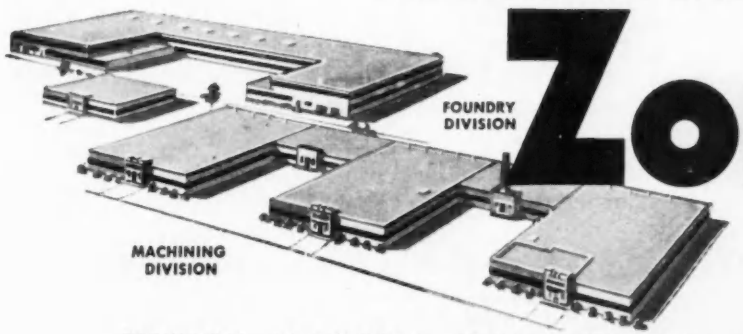
Stops Ring Groove Wear

Everywhere, engine builders and transport operators enthuse over the performance of Zollner Bond-O-Loc Pistons — "The greatest mileage piston we have ever used. Top ring groove wear problems are eliminated by the 'Ni-Resist' Iron section **permanently** incorporated with the double bond of both A1-Fin metallurgic **and the exclusive** Zollner mechanical lock." For longer piston life, better performance and lower maintenance cost, we suggest your immediate test of Bond-O-Loc advantages.



1. Reverse angle designed top ring section with tapered flutes, dovetail locks in all directions.
2. Positive mechanical interlock prevents any movement.
3. Reduces weight 25% to 30% with lower inertia stresses.
4. Increases surface areas carrying inertia load.

ZOLLNER CORPORATION • FORT WAYNE, INDIANA



ZOLLNER HEAVY DUTY PISTONS

PRECISION PRODUCTION FROM ENGINEERING TO FOUNDRY TO FINISHED PISTONS

POSITIVELY

TOTAL QUALITY CONTROL

You get better, more uniform oil seals as a result of National's 4-part quality program

1. New Seal Design
2. Incoming Materials
3. In-Process Control
4. Quality Assurance

In these four separate areas National follows rigid quality control mandates.

Quality Control Managers and teams reporting directly to National's General Manager work with Engineering to establish AQL's—Acceptable Quality Levels—for all new products. They supervise careful inspection of all raw materials in National Seals. They provide production inspection, monitoring performance of Manufacturing and developing new methods of in-process control. And finally, Quality Assurance, which is the periodic, random re-testing of production parts.

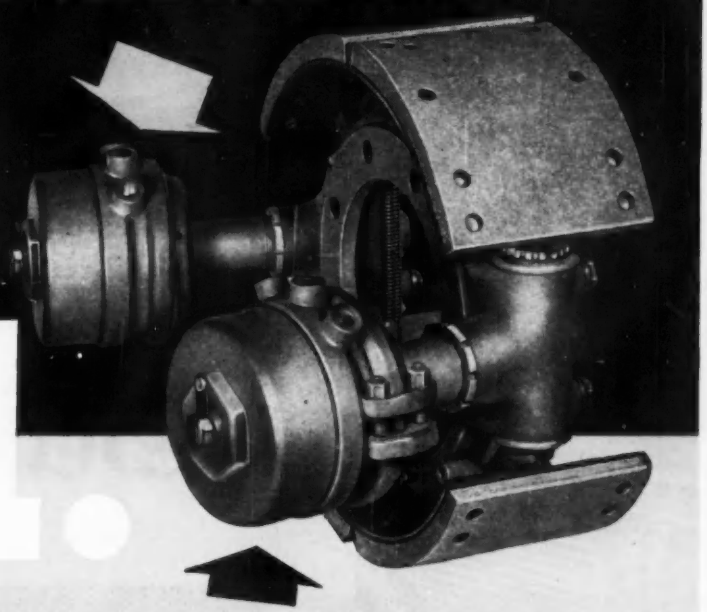
For dependability in seals, and the nation's finest oil seal engineering help, call your National Seal Applications Engineer (Yellow Pages under "Oil Seals") or write direct.

NATIONAL SEAL DIVISION, FEDERAL-MOGUL-BOWER BEARINGS, INC.
GENERAL OFFICES: Redwood City, California
PLANTS: Van Wert, Ohio; Redwood City and Downey, California

NEW STOPMASTER BRAKE

OFFERS THESE 3 BIG EXTRAS!

ANOTHER ROCKWELL-STANDARD FIRST!



Proven the most advanced brake design in 30 years . . .

Outstanding improvements, such as a new balanced shoe actuation principle and 15" diameter, have made the Stopmaster Brake the industry's most efficient and dependable brake. Now Rockwell-Standard also offers you these three important extras in the Stopmaster:

1.

"Fail-Safe" Units . . . now available for air actuated Stopmaster Brakes.

- Prevents runaway vehicles due to loss of air, when in operation or parked.
- Positive mechanical operation . . . can be installed to operate from dash control valve or automatically, or both ways if desired.
- Lightweight and compact . . . no installation problems, no cables or special brackets required.
- Provides mechanical parking brake . . . eliminates need for prop-shaft brake.
- Brakes easily released . . . without air pressure.

2

Automatic Brake Adjustment . . . available on all Stopmaster Brake sizes for trucks, trailers, and off-highway vehicles.

- Eliminates periodic manual adjustment.
- Cuts expensive maintenance costs.
- Brake maintains proper adjustment during entire lining life.
- Safer operation at all times.

3

Lubrication Eliminated. All actuating parts are sealed in lubricant. Standard on all models.

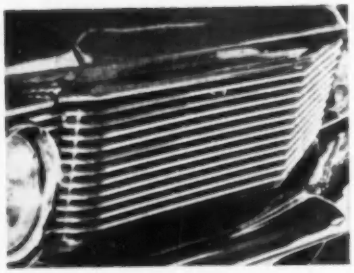
- Prevents oil-soaked linings due to over lubricating.
- Moving parts last longer.
- Reduces friction.
- Completely sealed unit reduces effect of elements.

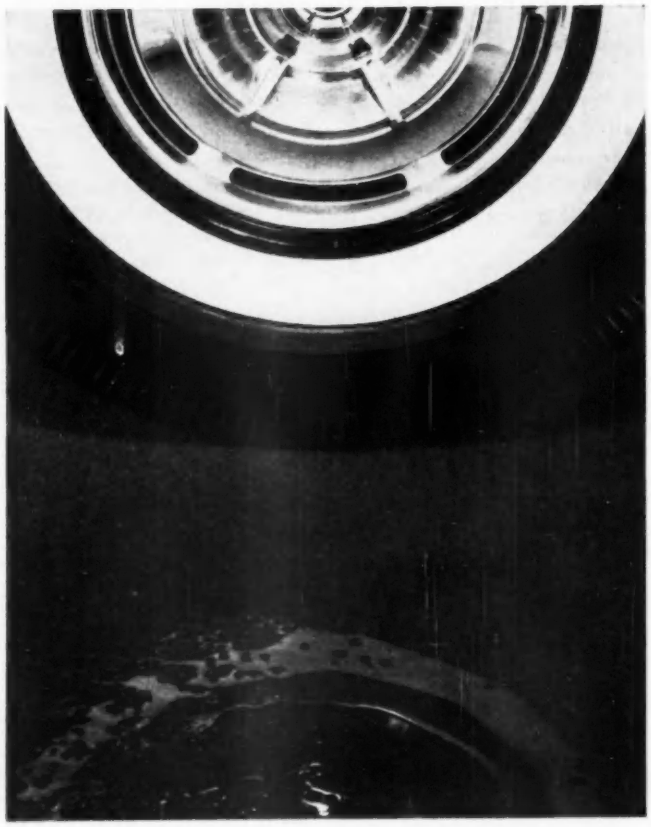
Another Product of... **ROCKWELL-STANDARD CORPORATION**

Brake Division, Ashtabula, Ohio

Circle 124 on Inquiry Card for more data

Build for Style and





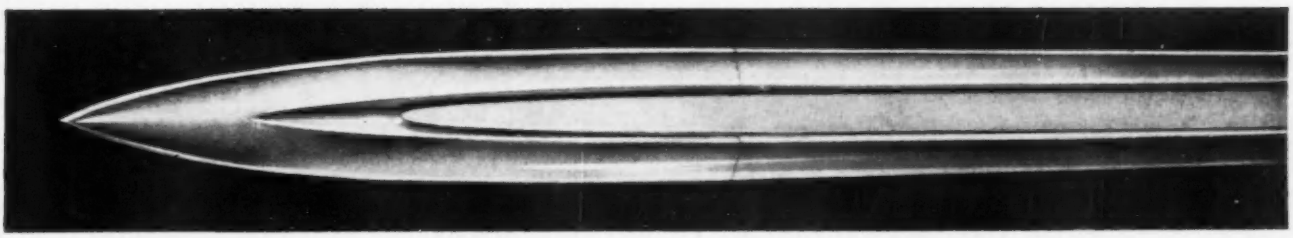
Sell with this symbol of versatile, durable stainless steel

Stylish wheel covers made from Armco 17-7 (Type 301) Stainless Steel shrug off effects of street chemicals, moisture, detergents and white wall cleaners. Moreover, they stay strong and rigid, maintain "spring."

Mirror-bright trim produced from Armco 17 Stainless Strip with Molding Quality Finish is also exceptionally durable. With normal precautions its luster holds through forming. Buffing is minimized.

Send coupon for technical data on these automotive-quality Armco Stainless Steels. Your nearby Armco Sales Office can quickly provide price and delivery information.

Stamina with Armco Stainless Steels



Armco Division • Armco Steel Corporation
1081 Curtis Street, Middletown, Ohio
Please send further data on these Armco Stainless Steels:
☐ 17-7 ☐ 17 Molding Quality
Name_____ Title_____
Firm_____
Street_____
City_____ Zone____ State_____

ARMCO **Armco Division**

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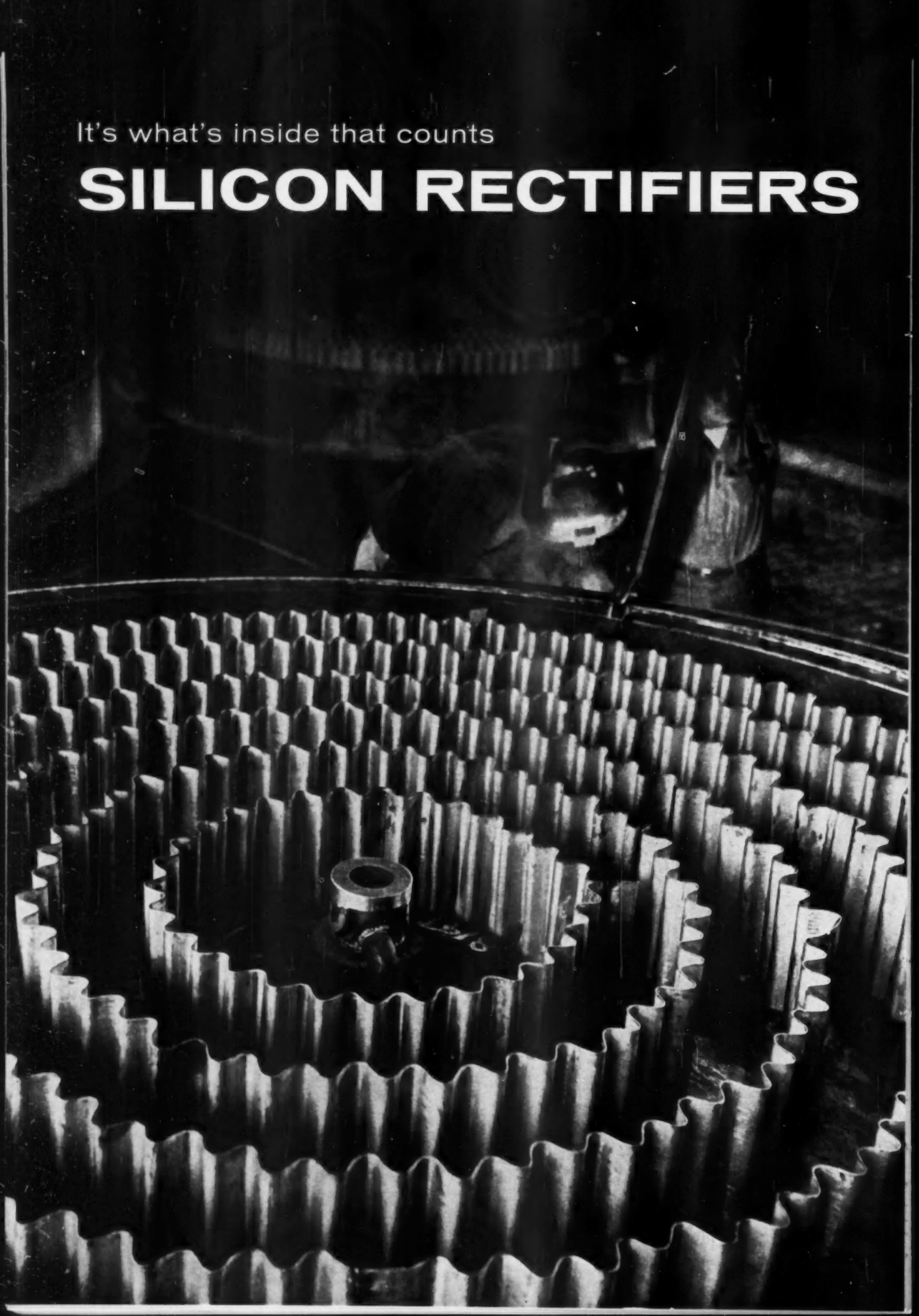
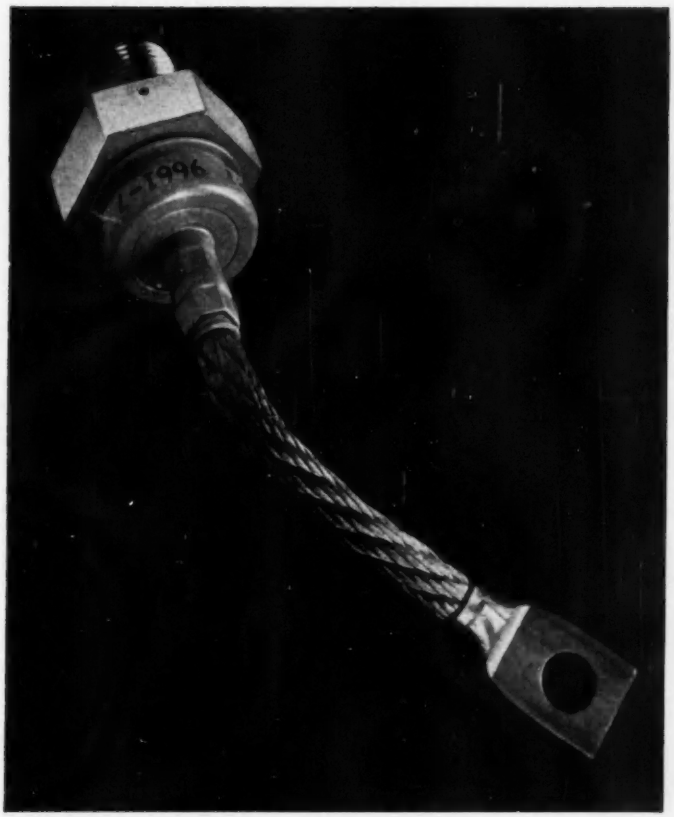
It's what's inside that counts

SILICON RECTIFIERS



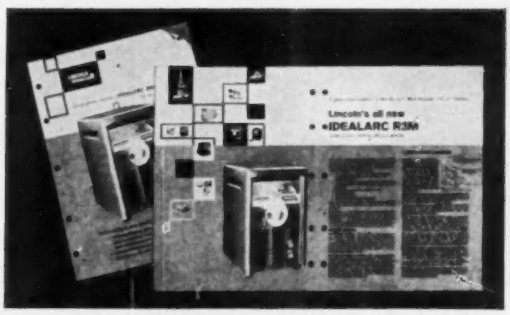
DON'T DETERIORATE

Because there is no gradual breakdown of a silicon diode, every LINCOLN Idealarc R3M three-phase rectifier welder will give top performance throughout its entire life. Here are the reasons why your welders should have silicon rectifiers.



Silicon rectifier diodes like this, used exclusively in the Idealarc R3M, are four times as efficient as selenium—increase welder efficiency—reduce power loss. Other important power considerations: balanced three-phase line draw—no starting surges—low idle current, about 15% of rated input.

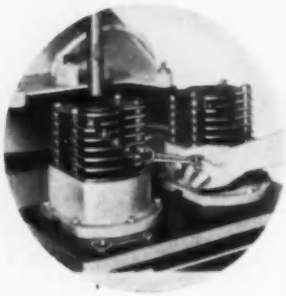
Note the minimum spatter in this photo. Here, and in the picture on the opposite page, annealing furnace bases of 309 stainless steel are being welded. The Idealarc R3M's steep volt-amp curve insures minimum spatter while unique electrical design gives smoothest possible arc characteristics, both highly desirable in stainless steel welding.



The Idealarc R3M is available in sizes from 300 to 650 amps. For full details covering applications, performance features, construction, specifications, optional features and prices, write for Bulletin 4609.1. The Lincoln Electric Company, Dept. 1711, Cleveland 17, Ohio.

LINCOLN WELDERS

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT AND ELECTRODES



QUALITY FOR YOUR PRODUCTS STARTS HERE

What better way to guarantee high quality products than to hone them on precision BarnesdriL Honing Machines!

New from top to bottom . . . these machines incorporate every advanced feature gleaned from our 35 years of honing experience.

Greater ruggedness . . . a broader range of capacities . . . more compact design . . . easier maintenance — these are plus-features inherent in every BarnesdriL machine to give you precision control at cost-cutting production speeds.

Our new catalog No. 200 gives complete details. Write for your free copy today!

BARNESDRIL HONING MACHINES

Honing Machines/Production Units
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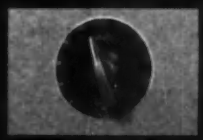
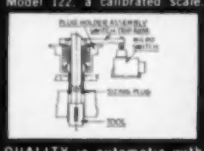


QUALITY is insured with correct hone feeds . . . made possible with this easy-to-set infinite hone feed control.

QUALITY at high-production rates means exact spindle speed rates . . . selected with a flick of the fingers.

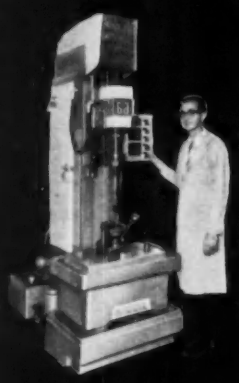
QUALITY results from correct reciprocation speeds . . . easily selected with this dial or, on the Model 122, a calibrated scale.

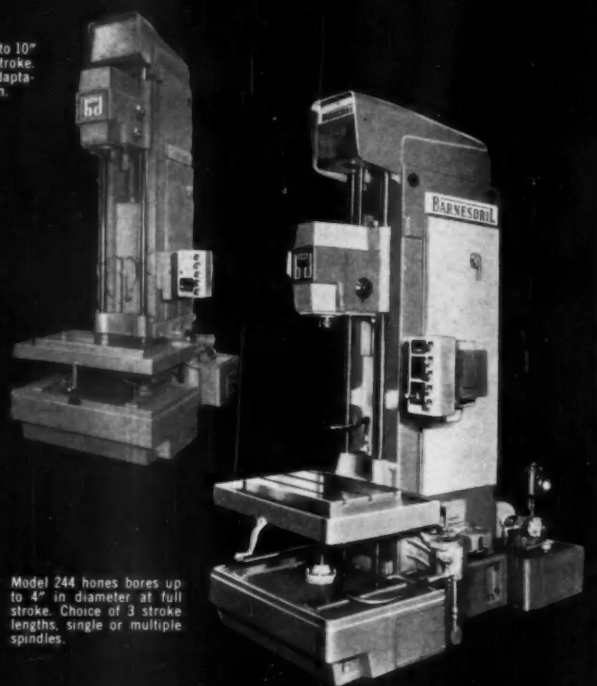


QUALITY is automatic with Plugmatic bore-to-bore sizing . . . production size consistency maintained to .0002".

Model 3010 hones up to 10" diameter at full stroke. Choice of 4 strokes. Adaptable for full automation.

Model 122 hones bores up to 2" in diameter at full stroke. Available in 1 or 2 spindles and a variety of fixtures and tables.



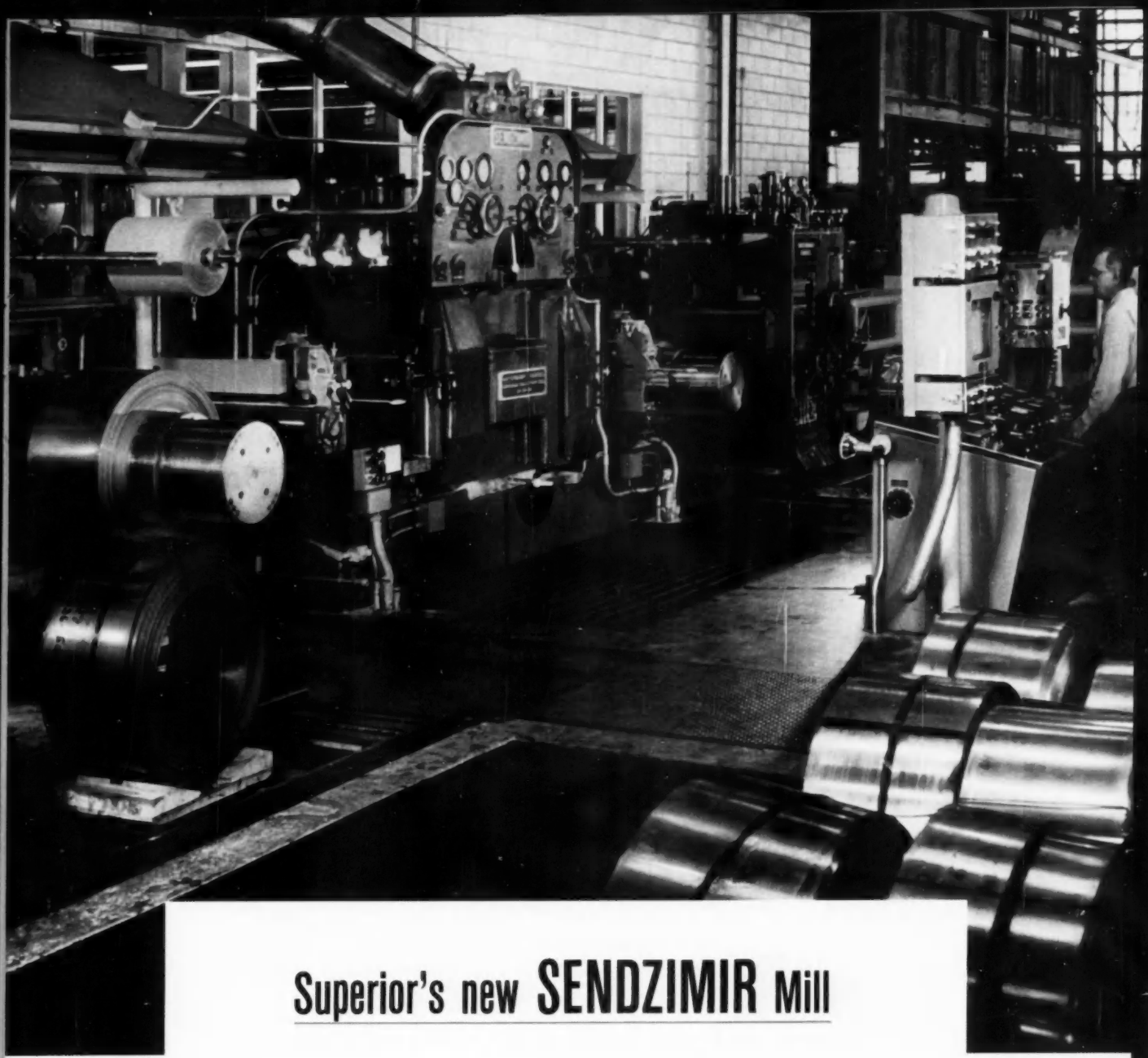


Model 244 hones bores up to 4" in diameter at full stroke. Choice of 3 stroke lengths, single or multiple spindles.

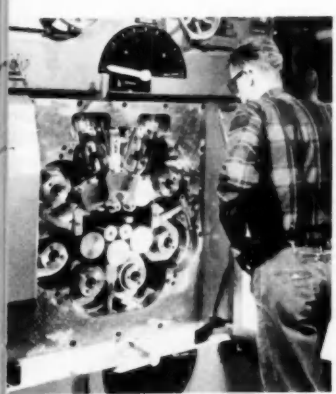
OUR FULLY EQUIPPED JOB HONING DEPARTMENT CAN HONE ANYTHING UP TO 25 FEET IN LENGTH. WRITE FOR DETAILS!

Circle 127 on Inquiry Card for more data

Circle 128 on Inquiry Card for more data →



Superior's new SENDZIMIR Mill



Close-up of the 18 back-up rolls providing tremendous power and rigidity to super-finished work rolls, for flawless precision strip production.

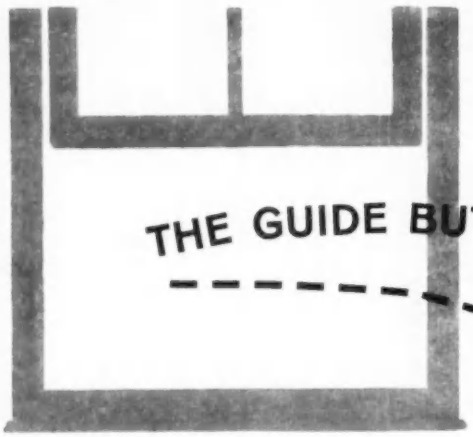
Fine-watch precision—
great power, rigidly controlled!

The ultimate in dimensional accuracy and finish is now available in Superior Strip Steel . . . in widths up to 24" . . . in larger and heavier coils . . . thanks to our new Sendzimir Mill with electronic continuous gage control. Strip is reduced to final gage at speeds reaching 1,000 feet per minute—every foot within required tolerances, beautifully finished for your most particular product requirements. Let us serve you with Superior Strip Steel *finer than the finest obtainable until now!* Write us about *your* requirements.

Superior
STRIP STEEL

SUPERIOR STEEL DIVISION
OF
COPPERWELD STEEL COMPANY
CARNEGIE, PENNSYLVANIA

For Export: Copperweld Steel International Company, New York

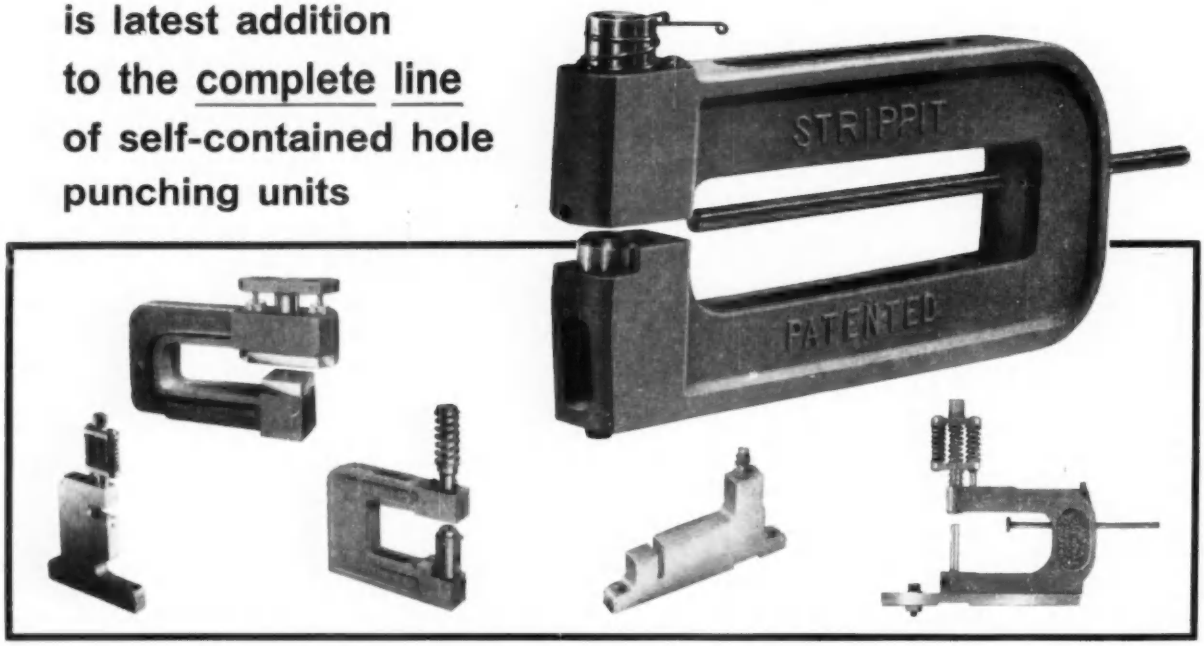


Wales STRIPPIT's new "BN" units have been designed for use *with or without* a guide button. Now, with this exclusive feature, only a punch and die (round or shaped) are required when you change from one hole size to another. For special applications and for optimum hole quality, the option of using a fitted or closed guide is still available.

THE GUIDE BUTTON GOES OUT THE WINDOW

NEW STRIPPIT "BN" SERIES

is latest addition to the complete line of self-contained hole punching units



Only STRIPPIT's "BN" units offer all these features:

- Use of fitted or closed guide button optional.
- All holders keyed for *both* round or shaped punches and dies.
- Self-storing keys supplied with each holder.
- Streamlined holder permits punching closer to leg of formed flanges and angles.
- New die section design permits easy removal and rotation of die without removing holder from set-up and retains the advantages and strength of one-piece construction.
- New threaded gage rod positions work more accurately and positively.
- All units, including ¾" unit, have hold-down slots for easier mounting.
- New stripping guide slips out quickly and easily without taking off retainer clip.
- One-piece oil hardened tool steel punches.
- Series expanded to include maximum hole size of 3½" in 10 gauge material.

WALES **STRIPPIT** INC.

A UNIT OF HOUDAILLE INDUSTRIES, INC.

242 Buell Road • Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ontario

In Continental Europe: Raskin S. A., Lausanne, Switzerland *In the British Isles: E. H. Jones (Machine Tools) Ltd., Hove, Sussex, England*

NEWS

Vol. 124, No. 2 Jan. 15, 1961

'62 Models Scaled Down

Big Three Plan 114-115-In. Wheelbases

By Hugh C. Quinn, Detroit Regional Editor, and C. B. Campbell, News Editor

The Big Three is set for round three in the "reverse bigness" contest, where the goal seems to be to think small rather than big. First it was the compact group of Corvair, Valiant and Falcon. Then came the medium compacts —Special, F-85, Tempest, Comet and Lancer. Along with these came a pulling in of some of the outside dimensions of the standard lines of cars.

The best move, as reported earlier in AI (June 15, 1960, P 37), is the wholesale scaling down of the standard models for 1962.

It would not be fair to call these new models compacts, even though their dimensions might be only slightly larger than the current compacts. These new models of Ford, Mercury, Chevrolet, Plymouth and Dart are merely reverting to the same general dimensions used in the early Fifties.

New models at Ford and Mercury will have a 115-in. wheelbase and overall length just under 200 in. Curb weight will be around 2800 lb, according to Detroit reports. These two cars have been labeled "Canadian X" and "Canadian Y" for design and engineering purposes. More affectionately they are called "Can X" and "Can Y".

Upper Models Retained

It appears the new, smaller models will supplement the current Ford and Mercury lines, filling in at the bottom while the upper models are retained for a year or two at their present size.

The same procedure seems to be planned at Chevrolet, where a 114-in. wheelbase car (called "Car H" in some quarters) is planned to replace the Biscayne while leaving the other models intact for a while.

Plymouth and Dart, however, are reportedly making their size switch complete, changing the entire 1962 line to 115-in. wheelbase.

At least two new engines are in the offing, one for the Ford-Mercury team and one for the Chevy. Both are planned as cast iron block, front-mounted engines —quite conventional in fact. Ford is setting up its Brook Park plant in Cleveland, while Chevrolet will build its engine in Tonawanda, N. Y.

NEW CADILLAC MODEL 7 IN. SHORTER

Cadillac's new Town Sedan model has interior dimensions of the Sedan de Ville but at 215 in. is seven in. shorter. Both models have same 129.5 in. wheelbase. The seven in. are taken from the rear deck and trunk.

Chevrolet, incidentally, has two new engines in the works, one a four and one a six. One report has it that they may, in reality, be a seven-bearing six that can be converted into a four.

Engine modifications and perhaps a new transmission are in the works for the Plymouth-Dart team. The new, shorter bodies, of course, are in for some fresh styling, with a departure from the traditional symmetry.

What the effect of these new models will be on the present compacts no doubt is causing some concern in Detroit inner offices. The "Can Y," for example, will give Mercury a car only one in. longer in wheelbase than Comet.

One result of this continuing segmenting of the market which will be heightened by the addition of minicars from Ford and probably Chevrolet (the 98-in wheelbase "O" car), will be a cost penalty. Instead of selling in the high volume area with a single car, the divisions will find themselves selling in the medium volume area with several cars.

This already has happened to Ford Div., where volume is now split between Ford and Falcon.

Romney Apologizes

George Romney, president of American Motors Corp., has admitted he was in error when he accused General Motors of intending to use its foreign facilities to import automotive components and has apologized to GM.

"It was a seriously inaccurate assertion in the verbatim account of my press conference statement in New York on Dec. 15," Mr. Romney declared.

"General Motors' facilities abroad were not established for the purpose of importing automotive components, and there is no evidence of that intention now.

"I want to make this correction in a statement that was widely distributed in news media through advertising and other means, for the simple reason that I was wrong in these specific assertions.

"Where I made a broad reference to the automobile industry, I did not intend this necessarily to include every company in the industry.

"For example, when I pointed out the decline in Michigan's share of total United States automotive employment, I was not attributing any deliberate action to any single company, large or small. I was simply noting and generally interpreting a statistical fact."

Declaring he intended to continue to direct attention to trends resulting from the failure of all consumers to share economic progress, he added:

"As long as these trends continue, we are faced with greater loss of domestic and world markets and weakening of our world competitive ability."

Slump Vanishing?

Before the new year was even under way, business already was showing signs of recovery from the 1960 slump, according to University of Michigan professor J. Philip Wernette. While most experts do not expect the recovery to start for three to six months, Wernette believes "the upstart will set in soon, and may already be under way."

The expert added the new year will be "very good," for the auto industry, with total sales running about the same as 1960, the second best year in history.

New Truck Engine

Ford will begin production next month on a new 262 cu in. six-cylinder truck engine, the largest in the truck line. Developed at a cost of $3.4 million, the "Big Six," as it is called, is rated at 152 hp. Truck Marketing Manager Will Chase said the new engine is designed to cut operating costs by 12 per cent.

IMPERIAL LEBARON FOR 1961

Smaller town-car-style rear window affords greater privacy for rear-seat passengers. Suggested list price, $6426.26, is far cry from discontinued 1960 LeBaron limousine which cost $15,600. Rear window has 802 sq in. of area, compared with 1479 sq in. of other Imperial models.

New S-P Chief Is 40

Studebaker-Packard Corp., has gone outside the automobile industry to name Sherwood H. Egbert, 40-year old West Coast executive, as president and chief executive officer. He succeeds

Sherwood H. Egbert

Clarence Francis as chief executive officer and Harold E. Churchill as president.

Mr. Francis remains as board chairman and Mr. Churchill, president since 1956, continues as a director and consultant. Mr. Egbert's appointment becomes effective Feb. 1.

Mr. Egbert was executive vice president of McCulloch Corp., Los Angeles manufacturer of motor driven chain saws and outboard motors. This is his first affiliation with an automobile company.

Mr. Egbert steps into a declining situation — declining sales, profits, and number of dealers. One of his first tasks will be to rebuild the faltering dealer organization, which has dropped by 300 during the last year.

Mr. Egbert has a five-year contract with S-P, although it should not take that long for him to deliver. Lark sales in 1960 dropped below the 1959 level, the second consecutive decrease in sales.

A sales increase in the next year or two would seem imperative to keep the corporation in the black, since tax credits soon will be used up.

The firm has tabled plans for a four-cylinder, four-passenger model to supplement the Lark. Money earmarked for tooling this car—about $26 million—may be used for diversification programs.

New Cars in '500'

At least 10 new cars will be included among a field of more than 60 entries seeking starting positions in the golden anniversary 500-Mile Race at the Indianapolis Motor Speedway on May 30.

That prediction was made by Speedway President Tony Hulman as official entry forms for the annual event were mailed to car owners, drivers and mechanics.

Entries will be accepted until midnight April 15 and the track will be opened for practice as usual on May 1. Time trials on the week-ends of May 13-14 and May 20-21 will determine starting positions in the 33-car lineup on race day.

One change in the 1961 entry form will require rookie drivers to prove their ability at speeds up to 135 mph—an increase of five mph over 1960—before being granted permission to practice for an official qualification attempt.

ENTERS PUBLIC TRANSPORT FIELD

Divco-Wayne Corp.'s new 38-passenger Super Cruiser is firm's first bus introduced for public rather than school transport. It has six-passenger lounge compartment in rear. Its 72-in. long side windows are said to be largest in the industry. A unique low-dip windshield offers 2295 sq in. of driver visibility.

NEWS

CONTINUED

Firm to Change Name

Minneapolis-Moline Co. plans to change its name to Motec Corp. Stockholders will be asked to vote on the change on Feb. 21.

The name of the 30-year-old company, evolving from several consolidations, no longer has meaning for a concern that has its headquarters in Hopkins, Minn., and has no manufacturing facilities in Moline, Ill.

The new name is derived from "MOdern TEChnology" to indicate the concern's present operations in farm equipment, industrial and construction equipment, materials handling, and electronics as well as in commercial research and development.

U. S. Rubber Expansion

The United States Rubber Co. plans to spend more than $53 million this year to modernize and expand manufacturing facilities and to intensify its research and development program.

George R. Vila, president, said about $30 million will be spent for modernization and expansion, a 20 per cent increase over the 1960 figure. Production of synthetic rubbers, plastics, chemicals and synthetic fibres will be expanded, especially in foreign plants. Emphasis, Mr. Vila said, will be placed on quality control through automation of tire production facilities.

Beech Net Up 22 Pct.

Beech Aircraft Corp. has reported record 1960 net earnings of $4,854,059, a 22 per cent increase over fiscal 1959. Total sales of $98,873,800 included $46,570,254 sales of Beechcraft's business and commercial aircraft products, also a 22 per cent rise.

Net earnings were $5.41 per share as compared with $4.51 in 1959 and $3.84 in 1958.

SPORTS CAR BECOMES STATION WAGON

Tornado "Sportsbrake" is based on British-built Tornado sports car, with a fiberglass station wagon superstructure replacing coupe's detachable hardtop. Optional power units are Ford Anglia, Consul or Triumph TR3 engines.

Ford's Brazilian Plans

Ford Motor Co. will ship tooling from the U. S. to Brazil for the manufacture of a standard-size passenger car called the Brasileiro. It will be a slightly modified 1959 Ford and production is scheduled to begin toward the end of 1962 at the Ford Motor do Brasil plant in Sao Paulo.

The production plan hinges on permission from the Brazilian National Development Bank to import production equipment.

The Brasileiro will be about 99 per cent Brazilian-made. Ford Motor do Brasil already is manufacturing the F-100, 350 and 600 trucks, and a tractor line. The company employs about 2600 persons and operates an assembly plant, engine plant, stamping plant, plus a parts depot and engineering test garage. A 116,000 sq ft foundry is located at Osasco, 15 mi. from Sao Paulo.

The Ford do Brasil engine, used in the three trucks, is a 168 hp V-8.

Record Bendix Sales

Net sales and other operating income of the Bendix Corp. for the 1960 fiscal year were $792 million, its best peacetime year, Malcolm P. Ferguson, president, reported.

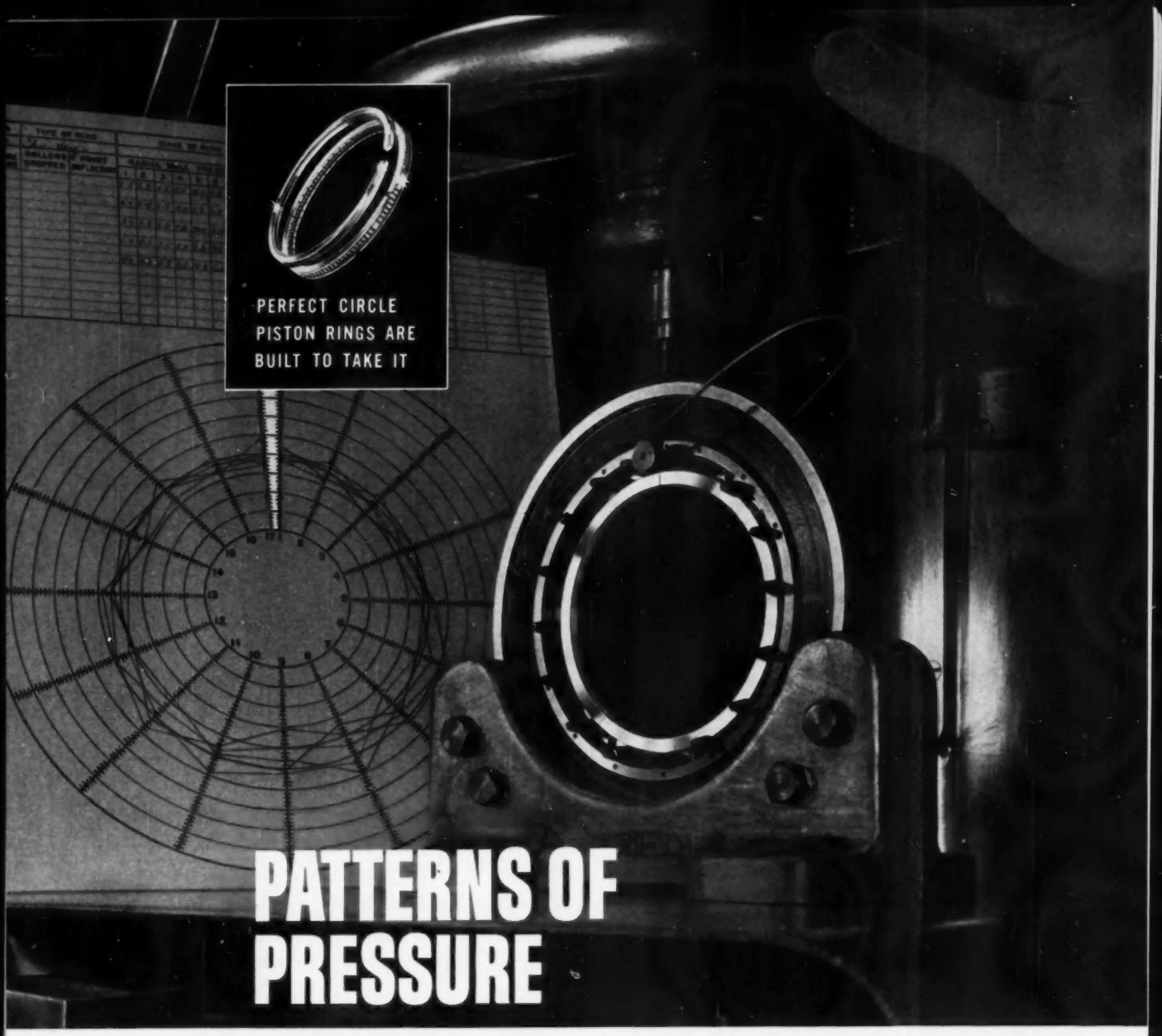
The 1960 sales were 15 per cent above the 1959 figure.

Net income was $26.1 million, or $4.88 per share. These figures compare with $27.4 million in 1959 and $5.37 per share.

Sales of Bendix automotive products amounted to $121 million compared with $114.4 million the previous year.

Hadley Installed

Harlan V. Hadley, manager of the Washington, D. C. office of the Automobile Manufacturers Association, has been installed as regional vice chairman of the Manufacturing Trade Associations of the National Industrial Council.

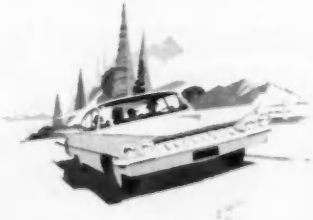


PATTERNS OF PRESSURE

Every size and type of Perfect Circle ring is designed to have the correct radial pressure distribution for the type of engine in which it is to be used.

Processes and equipment are carefully developed, through the use of precision gauges, to produce the exact pressure required. Radial pressure is accurately measured at 17 points around the ring and the measurements are then graphically plotted.

Testing such as this is your assurance that Perfect Circle rings are built to take it. Rely on Perfect Circles—the most preferred piston rings.



PERFECT CIRCLE

PISTON RINGS · PRECISION CASTINGS · POWER SERVICE PRODUCTS · SPEEDOSTAT

HAGERSTOWN, INDIANA · DON MILLS, ONTARIO, CANADA

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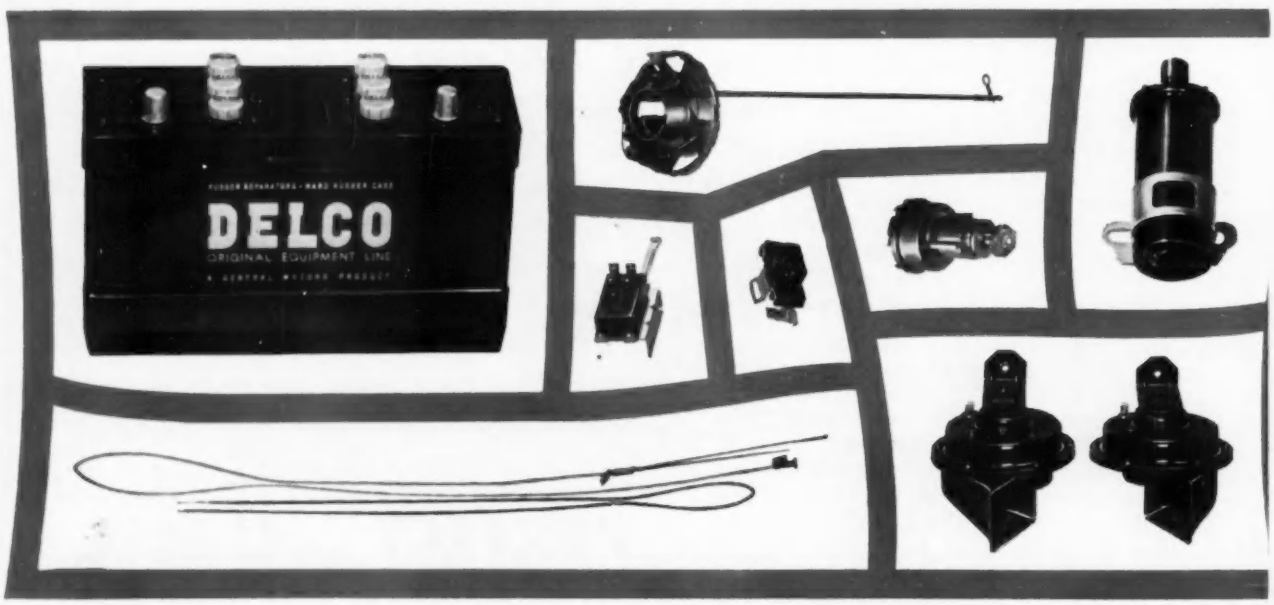
Corvair by Chevrolet

Tempest by Pontiac

...electrical systems

Delco-Remy systems provide electrical energy for the needs of motion in General Motors new size cars, too. Special electrical systems were developed by Delco-Remy working closely with Chevrolet, Pontiac, Buick and Oldsmobile. In all four new cars, these lighter units deliver the same kind of reliable high performance that has been built into Delco-Remy electrical systems for over fifty years.



Special
by
Buick

F-85
by
Oldsmobile

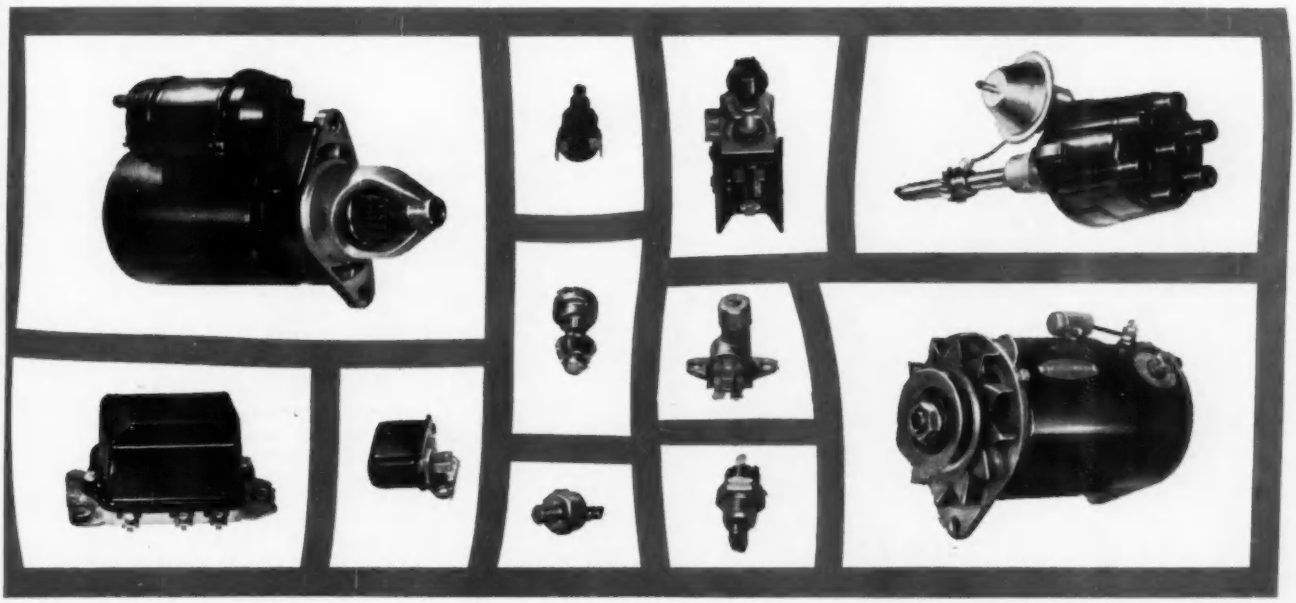
by Delco-Remy

Delco-Remy equipment for the Corvair, Tempest, Special and F-85 includes • Generators • Regulators • Cranking Motors • Distributors • Ignition Coils • Horns • Flexible Cable Controls • Directional Signal and Control Switches • and Delco Batteries.

Delco-Remy electrical systems

From the highway to the stars

DIVISION OF GENERAL MOTORS, ANDERSON, INDIANA



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(Advertisement)

WEATHER
Fair, Mild

T-J
TOMKINS-JOHNSON TRIBUNE

★★★★★
FINAL

THE TOMKINS-JOHNSON CO. • 2425 W. Michigan Ave. • Jackson, Michigan

INCREASED PRODUCTION... CREATES PRICE ADJUSTMENT

on T-J Squair Head Cylinders

JACKSON, MICH. JAN. 3 (TP)—"Due to the tremendous initial response and the continuing acceptance and purchase of the new Tomkins-Johnson Squair Head Cylinders, it has been possible to *lower* the basic price," according to T-J personnel. In effecting this price cut, Tomkins-Johnson has again proven that acceptance of a quality product and the inevitable increase in manufacturing volume *CAN* economically justify a price reduction *WITHOUT* jeopardizing quality.

The T-J Squair Head Cylinder, an interchangeable air cylinder for any pneumatic power application, was first introduced by Tomkins-Johnson in 1958. It was an immediate success because of its availability in a wide range of bore sizes and strokes . . . as well as the standard quality features, including the new T-J Super-Cushion for air cylinders.

Other Standard Features

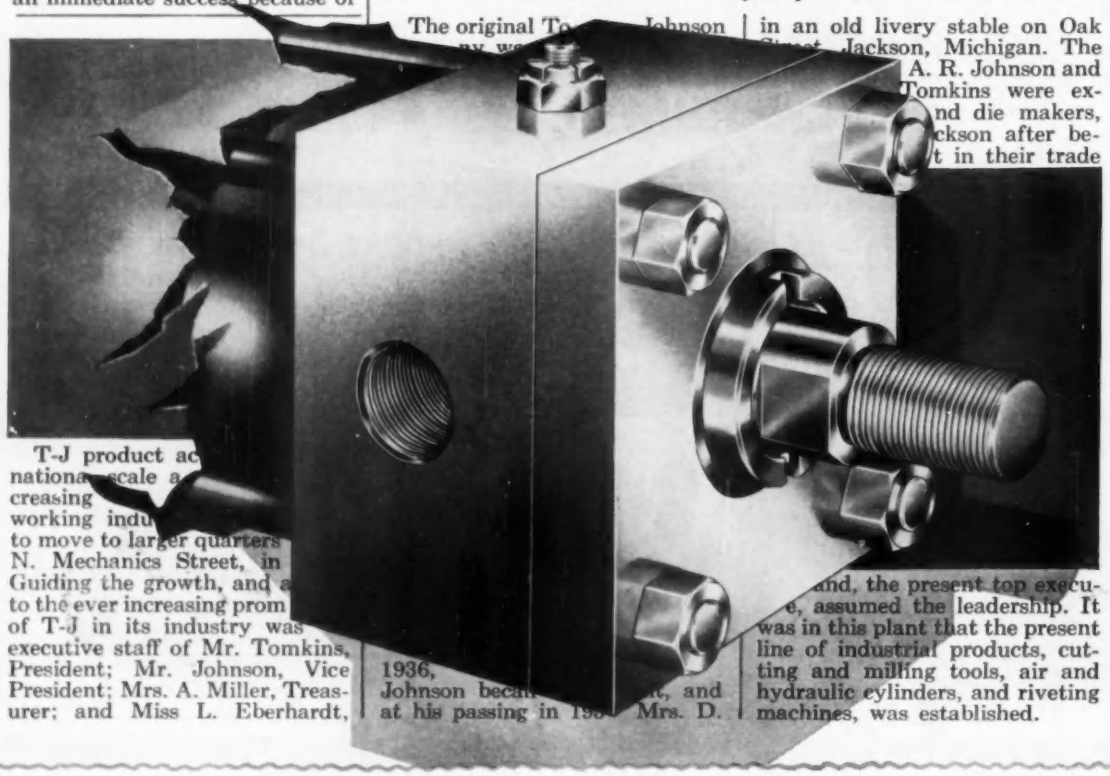
Other standard T-J features that allow the T-J Squair Head Cylinder to retain its high quality comparison over other makes of air cylinders and still give you lower price are; solid steel heads and mounting plates, hard-chrome plated bodies and piston rods, leak-proof cylinder head to body construction, heavy duty, high tensile ground and polished chrome, plated piston rod, and many more . . . STANDARD AT NO EXTRA COST.

Tomkins-Johnson, by virtue of the announced lower cost on its Squair Head Cylinder, wish to thank their customers for their initial acceptance which has been such a contributing factor in this price reduction.

T-J Produces Complete Line

Tomkins-Johnson also produces a complete line of hydraulic and pneumatic cylinders for *EVERY* power drive application . . . including the very popular Spacemaker. If you need further information or complete catalog material, write T-J direct, or request it from your T-J sales representative.

The Tomkins-Johnson Company was founded in 1917



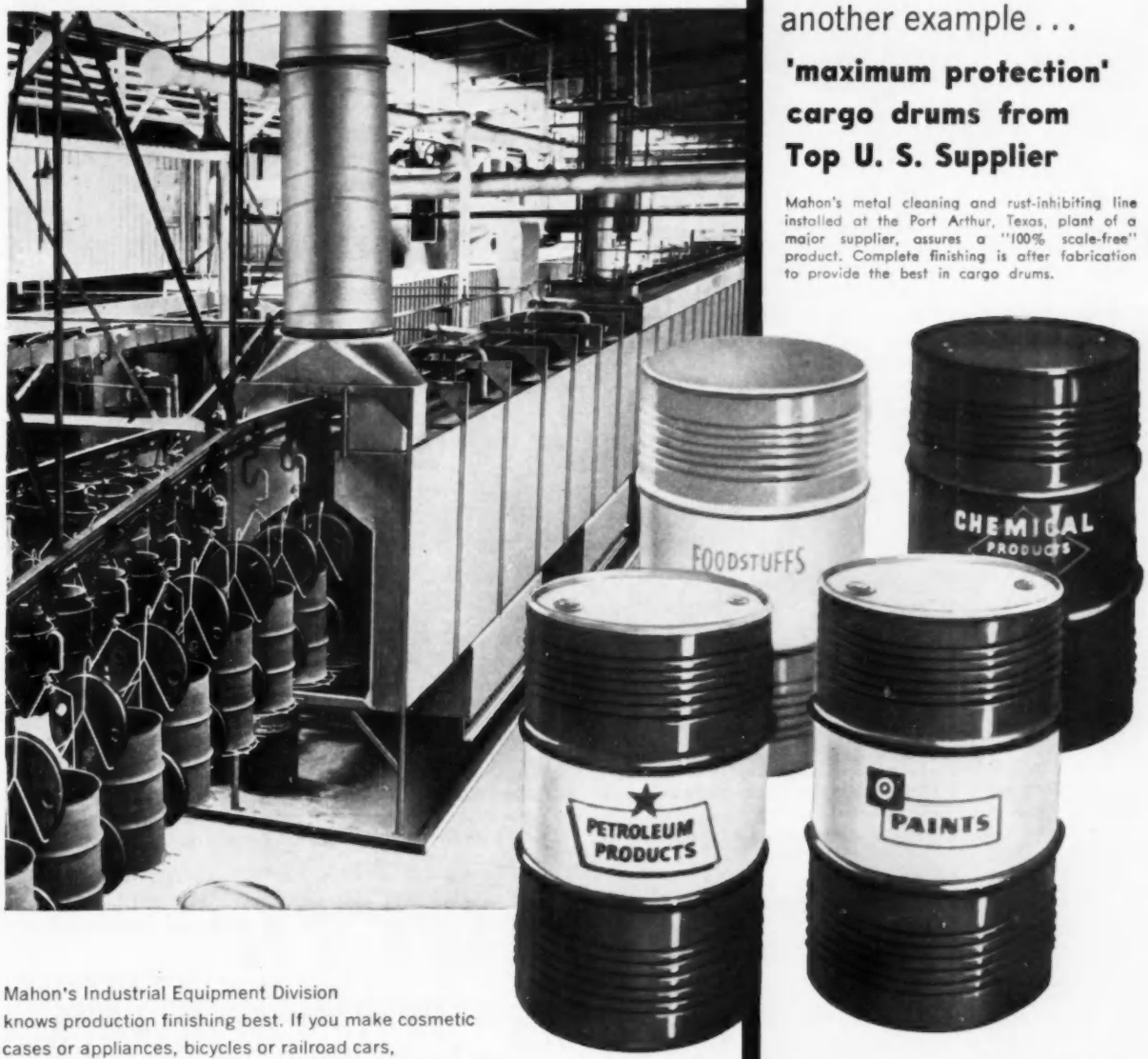
The original To[illegible]Johnson [illegible] in an old livery stable on Oak [illegible] Jackson, Michigan. The [illegible] A. R. Johnson and [illegible]Tomkins were ex-[illegible]nd die makers, [illegible]ckson after be-[illegible]t in their trade

T-J product ac[illegible] nationa[illegible]scale a[illegible] creasing [illegible] working indu[illegible] to move to larger quarters N. Mechanics Street, in [illegible] Guiding the growth, and a[illegible] to the ever increasing prom[illegible] of T-J in its industry was [illegible] executive staff of Mr. Tomkins, President; Mr. Johnson, Vice President; Mrs. A. Miller, Treasurer; and Miss L. Eberhardt,

[illegible]and, the present top execu-[illegible]e, assumed the leadership. It was in this plant that the present line of industrial products, cutting and milling tools, air and hydraulic cylinders, and riveting machines, was established.

1936, [illegible] Johnson becam[illegible]t, and at his passing in 19[illegible] Mrs. D.

Quality metal products deserve
"the finishing touch" of Mahon



another example . . .

'maximum protection' cargo drums from Top U. S. Supplier

Mahon's metal cleaning and rust-inhibiting line installed at the Port Arthur, Texas, plant of a major supplier, assures a "100% scale-free" product. Complete finishing is after fabrication to provide the best in cargo drums.

Mahon's Industrial Equipment Division knows production finishing best. If you make cosmetic cases or appliances, bicycles or railroad cars, or any other metal product . . . and if quality comes first . . . call in Mahon. Improved finishing can be the easiest and most economical product improvement you'll ever make. New paints, new methods broaden the possibilities. Find out what the 'finishing touch' of Mahon can do with your products . . . your costs . . . your sales. Get in 'touch' with Mahon.

MAHON INDUSTRIAL EQUIPMENT

• Finishing Systems • Metal Cleaning Equipment • Painting Facilities—spray, dip and flo-coaters • Drying and Processing Ovens • Special Plant and Production Equipment

WRITE FOR MAHON CATALOG A-661
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DETROIT 34, MICHIGAN
MANUFACTURING PLANTS—
Detroit, Michigan and Torrance, California
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YOUR BIGGEST VALUE IS IN MAHON'S PLANNING & ENGINEERING EXPERIENCE

MAHON

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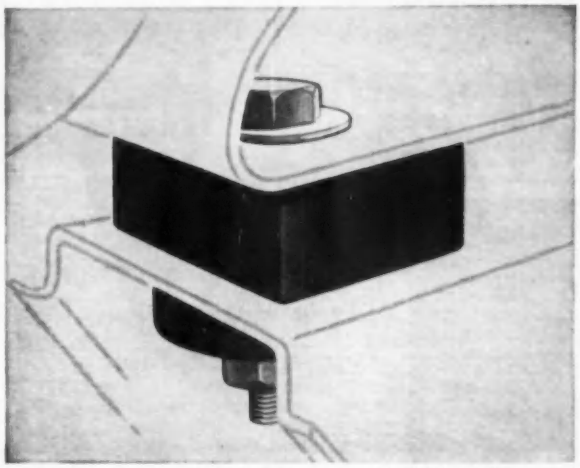
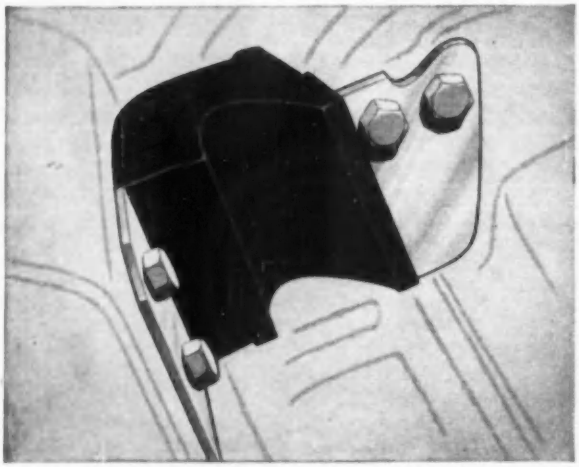


BODY MOUNTS of Enjay Butyl offer the highest degree of vibration and sound isolation of any rubber on the market. Result? Cars that stay tight and quiet for years.

WEATHER STRIPPING of Butyl resists deterioration. Resists such enemies as: ozone; sunlight; water; and aging. Result? Better performance and durability.



ENGINE MOUNTS of Butyl dampen motor vibration and road impact. Result? Elimination of shock-damaged engines ... decreased car "shiver" during idling ... and reduced engine rumble.

RADIATOR HOSE of Enjay Butyl holds off deterioration from heat, rust inhibitors, anti-freeze and other chemicals. Keeps its shape and resiliency for years.

ENJAY BUTYL

still leading the performance parade in over 100 uses

From sound-deadening body mounts underneath...to element-defying weather stripping outside – Enjay Butyl Rubber gives car manufacturers still more reason to say their new models are the best ever. Today, all American car manufacturers are using Butyl.

Today, they are finding ever so many ways to use this amazingly versatile rubber in their products. Butyl can improve your product, too. Contact the nearest Enjay office. *Home Office:* 15 West 51st Street, New York 19, New York. *Other Offices:* Akron • Boston Charlotte • Detroit • Houston Los Angeles • New Orleans Plainfield, N. J. • Tulsa

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

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ENJAY® BUTYL

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NEWS FEATURES

'60 Sales Were 2d Best

Only Studebaker Failed to Surpass '59

Automotive executives must have had some mixed emotions when they rang in the New Year. For the most part, they were in a festive mood, because 1960 had been a good year. New car sales totaled 6,145,000, making it second only to 1955.

But these same executives knew that 1961 was not starting off the right way. Record field stocks made plant shutdowns imperative, and nobody makes money when plants are down. General Motors, Chrysler, Ford Motor Co. and American Motors all had good years, showing increases over 1959. All five GM divisions registered increases, with Chevrolet and Cadillac marking their best years in history.

Dodge's Best Year

All three Chrysler divisions were up, with Dodge Div. turning in its best effort yet.

Ford Div. sales were down from 1959, but a 29 per cent increase by Lincoln-Mercury Div. kept the company's total sales above the previous year.

Rambler sales of 434,704 units set a new mark for AMC. But Studebaker-Packard Corp could not keep up the pace, and sales fell off about 30,000 units from '59.

Chevrolet set its record with sales of 1,730,091 units, which exceeded 1959 by 21.5 per cent and topped the division's previous record, set in 1955, by 7346 units. Chevy's 1960 total included 235,315 Corvairs.

Cadillac's 151,954 sales topped the 1955 high by 8343 units.

Dodge sales of 357,959 cars topped 1959 by 107 per cent, and surpassed the previous Dodge record (1951) by 44,225 units.

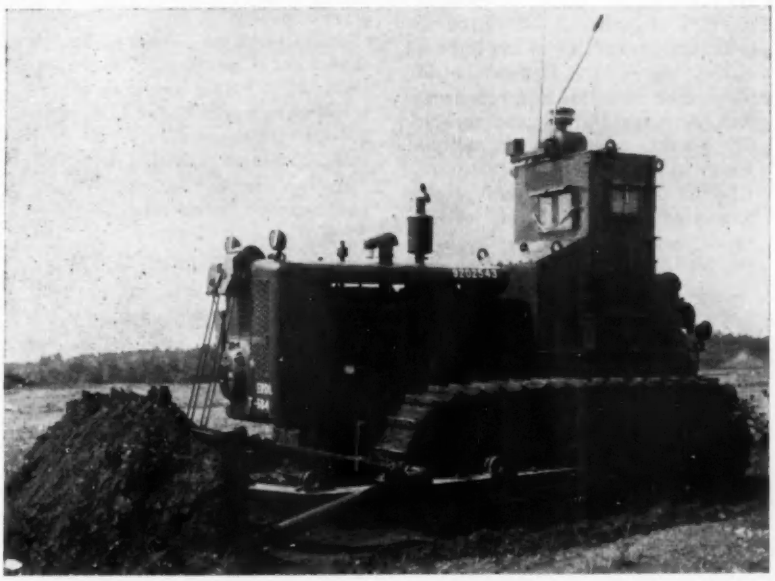
Pontiac sales of 409,607 topped 1959 by six per cent, Buick sales of 271,305 were up 12 per cent, and Oldsmobile's 363,375 topped '59 by a slim margin.

GM had total new car sales of 2,926,392 in 1960.

Chrysler sales of 925,620 were 32 per cent ahead of 1959. Plymouth sales, bolstered by Valiant,

(*Turn to page* 47, *please*)

ARMY DEVELOPS LEAD-SHIELDED CAB



Lead-shielded cab for bulldozers operated in radioactively contaminated areas has been developed by the Army Engineer Research and Development Laboratories. Cab's walls are laminated with lead core 1⅛ in. thick between two 3/16-in. steel plates. Lead glass windows are two in. thick.

AI TABLOID

American farmers use enough rubber each year to make tires for six million passenger cars. J. W. Haney, farm tire manager for Goodyear Tire & Rubber Co., says there is an average of 67 wheels—and tires—on farms of between 500 and 1000 acres and 110 wheels on farms over 1000 acres.

* * *

Three translations of Soviet technical literature on chemical engineering and two on rubber have been released for sale to industry and the public through the Office of Technical Services, Business and Defense Services Administration, U. S. Department of Commerce.

* * *

The Bureau of Public Roads, U. S. Department of Commerce, has given official approval to the newly approved national standards for traffic signs, signals and markings. The new standards are contained in a manual drafted by the National Joint Committee on Uniform Traffic Control Devices.

* * *

Shipments of complete civilian aircraft amounted to 1,910,100 lb in October, according to the Bureau of the Census, U. S. Department of Commerce and the Federal Aviation Agency. During the month, 618 planes valued at $81 million were shipped by manufacturers. Unfilled orders for civilian planes amounted to 518 at the end of October, less than one per cent above the backlog in October, 1959.

* * *

Four translations of Russian technical literature on electronic computer engineering, electrostatic problems, and paramagnetic absorption have been released to industry and the public.

* * *

Current developments in welding rocket motor cases, detecting and avoiding brittle fatigue, reducing restraint problems in heavy welding, and measuring fatigue data in precipitation-hardenable stainless steels are reported in four memorandums.

Tests of more than 1100 thin metal films to determine their value as corrosion indicators for packaged material are evaluated in two Air Force research reports.

* * *

Lack of originality on the part of Russian chemists and their reluctance to learn and supply modern chemical structures and reaction theory have handicapped the Soviet Union in developing an organic chemicals industry.

* * *

Prime government contracts awarded to small firms under the Small Business Administration program increased 136 per cent in number and 37.7 per cent in value during the first quarter of fiscal 1961. During July, August and September, 1960, small concerns received 6456 government contracts valued at $286,277,447.

* * *

The most promising future for explosive forging seems to lie in extending it to new and different operations now beyond the scope of conventional equipment, rather than duplicating the results of conventional methods. This is the claim of a Navy technical report released to business and the public by the Office of Technical Services, Business and Defense Services Administration, U. S. Department of Commerce.

* * *

Eight translations of foreign technical literature on physical chemistry have been released for sale to the public through the Office of Technical Services, Business and Defense Services Administration, U. S. Department of Commerce.

* * *

The states distributed $3.1 billion for state highways and $1.3 billion for local roads and streets in 1959. This was a portion of the $5.1 billion collected in state motor fuel taxes, motor vehicle registration fees, and allied road-user imposts.

Dr. George H. Brown has been appointed marketing research manager for Ford Motor Co.

Translucent Tires

Translucent tires in a rainbow of colors may permit auto stylists of the next decade to carry their color schemes right down to the pavement. They are under development by the Goodyear Tire & Rubber Co.

Although the unique tires have been road-tested at 65 mph, they are not for sale and may not reach the market for possibly a decade, according to Walter Lee, Goodyear tire research and development director.

"Judging from our work so far, however, we know that the pourable, or castable, tire will provide treadwear far beyond today's standards," Mr. Lee said. "Its smooth, glistening appearance and receptiveness to virtually any color should open new vistas of thought for auto designers."

In contrast to present-day tires, the experimental tire is a solid piece of synthetic rubber, without fabric or laminations, Mr. Lee disclosed.

(*Continued from page* 45)
totaled some 450,000 units. Sales of the Chrysler car topped 80,000, a gain of 22 per cent.

All was not bad news at Ford Div. Although total sales for the division were down about six per cent, three bright spots marked the year-end report. (1) Thunderbird sales of 81,400 were the best year; (2) Falcon continued to gain momentum, with sales of 457,000 for the year, and (3) the final quarter of 1960 showed an encouraging 23 per cent increase, pointing to a good year in 1961.

Unexpected success of the Comet has kept Lincoln-Mercury Div. on the rise, with total sales of 365,000 units for the year. The industry built 6.7 million passenger cars last year, with many divisional production records. But this high production—or at least a prime result of the high production—is what gave the automakers extra headaches early in the New Year. All five companies cut production schedules and laid off employes in early January, with more layoffs scheduled.

Chrysler led the way with a near-general shutdown between Christmas and Jan. 9. The Chrysler Jefferson plant was the only assembly plant operating. When Chrysler got back into operation Jan. 9, some 2700 workers in Los Angeles, St. Louis, and Newark, Del., were not called back.

American Motors shut down Jan. 6 for 10 days, with 2180 employes scheduled for an indefinite lay-off beyond the call-back date of Jan. 16. General Motors figured that some 6800 of its laid-off employes would not be called back.

FLUOROSCOPE FOR TIRES

Research engineer of United States Rubber Co. examines steel cord structure of a truck tire revealed by new fluoroscope developed by Picker-X-Ray Corp. He holds print of picture visible through eyepiece (left) of instrument.

$7 Million Tax Break

The Big Three auto makers got a $7 million break from the Michigan State Tax Commission in the form of a reduction in assessment on Detroit property. But the tax cut was a long way from what the three automobile makers had requested.

The commission cut General Motors' personal property assessment from $156 million to $152.3 million. The Chrysler figure was set at $165.4 million, $3 million below the City of Detroit assessment. And the Ford Motor Co. value was set by the state at $8.2 million, or $306,000 less than the city figure.

Zollner Gets Degree

Tri-State College, Angola, Ind., has conferred the honorary degree of Doctor of Engineering on Fred Zollner, president of Zollner Corp., Fort Wayne, Ind.

Mr. Zollner, a member of the Society of Automotive Engineers and many other organizations, is best known for his improvement on piston designs and for his advances in aluminum alloy internal combustion engines.

EUROPEAN ROUND-UP

By DAVID SCOTT • Special Correspondent

English Ford is making a serious study of the Hobbs Mecha-Matic transmission (A. I., July 1, 1954), and is understood to have a number of units under test. The company is considering making the gearbox under license, viewing it as suitable for the present Anglia and possibly for the slightly larger model to be introduced in the spring.

This will enable Ford to rival Rootes' small-car Easidrive offered in the Minx, since hydraulic clutches in the Hobbs transmission eliminate the mechanical losses of the usual hydraulic coupling or torque converter. Hobbs, formerly in the B.S.A. stable, was recently taken over by Westinghouse Brake & Signal.

The Gyreacta transmission (A. I., Aug. 1, 1954) is another British development finally seeing the light of day. The government's National Research Development Corp., sponsoring the project, is planning the first public demonstration this month.

This transmission stores energy from braking in a 200-lb flywheel running in a vacuum at 15,000 rpm, then releases it during acceleration to assist the engine. It is intended for city buses continually stopping and starting. Fuel saving is claimed to be 30 per cent. Kinetic energy delivered by the loss of 1000 revolutions during a 15-second acceleration burst is calculated to equal 120 hp—more than the output of the standard bus engine.

Consulting engineer Robert Clerk, inventor of the Gyreacta, has designed a machine for cold-rolling precision gears that Sykes Machine Tool Co. may put into production. Teeth are pressed in undersized blanks by straight forming racks like those used for spline rolling, and ram speeds of 1400 fpm are said to eliminate metal overflow.

Self-Servo Brake

Dunlop has patented a self-servo brake utilizing the torque reaction of one road wheel. The master cylinder operates on one rear wheel whose back plate is free to rotate slightly. The twisting movement actuates a second master cylinder that applies hydraulic pressure to the other wheels.

A small injector nozzle less than two in. long has been developed by Ricardo in conjunction with C.A.V. Main feature is a spring-loaded poppet valve in the base of the unit that opens outward under hydraulic pressure. This design is said to slash production costs, since close tolerances in manufacture are not required.

Perkins has produced a turbocharged version of its 340-cu in. Diesel that International Harvester is fitting to its BC170 and BC180 heavy trucks intended for high-altitude operation in mountainous export markets. The inward-radial-flow blower raises output to 130 hp gross at 2850 rpm against 112 hp at the same speed for the standard engine.

Jaguar is planning a 180-mph competition sports car which may appear next year. It is understood to be of unitized construction made entirely of aluminum alloy with riveted joints, and similar to the Jaguar entered by Briggs Cunningham in the Le Mans race last June.

German Ford has repeated the denials of the parent company that it will introduce a new small car in 1961. The Cologne factory states that its Taunus 12M will appear unchanged at the Frankfurt Motor Show in September.

Citroen has disclosed a few design details of a supercharged heavy-duty gasoline engine whose torque increases as speed drops. It is a two-cycle with fuel injection, with the air compressor driven by a small auxiliary gas unit. Throttles of the two engines are coupled so that one opens as the other closes, causing the main engine to receive an increasing charge of air as its revolutions fall. The small engine also drives the generator, and is used as a starter motor.

The Russians have brought out a farm tractor in which all four wheels are independently steered, enabling the machine to move in any direction, in tight circles, and even to swivel on a vertical axis. Wheels of the same size are positioned at each corner of the box-section frame, where they are carried on pivoting support arms steered by individual hydraulic jacks.

Hydrostatic Drive

Drive is hydrostatic, with a separate axial-piston motor in each hub powered by a pair of similar Diesel-driven pumps. Direction of rotation of each wheel is controlled independently by reversing the oil flow.

The Soviet auto industry has just produced its 500,000th Moskvitch car, and the new Zaporozhets baby car is now reported to be on sale. This model is powered by a 23-hp air-cooled engine at the rear.

Air Force Seeks Industrial Modernization For Tomorrow's Cheaper, Better Weapons

The doctrine of industrial modernization, being promoted by the Air Force, was discussed in Detroit recently by Fred Hill of the Aeronautical Systems Center, Wright-Patterson Base. Back of this nationwide effort is the conviction that modernization—in a true economic sense—will produce the sophisticated weapons of tomorrow at lower costs and with a greater degree of reliability.

The Air Force message is of interest to all manufacturers, particularly those in the automotive industries. Mr. Hill said "the contractor who needs modern equipment is already paying for it but is not getting the results."

This modernization objective is imperative in the interest of combating the skyrocketing costs of new weapons systems. Some specific examples cited by the Air Force indicate that dramatic savings can be achieved through the use of modern equipment such as numerically controlled machines and automation devices aimed specifically at small lot production. It also is insurance for the country since the unique materials and configurations of the weapons of tomorrow cannot be fabricated efficiently with the kind of equipment in use today.

It has taken the Air Force a few years to get the program under way on a large scale. The expenditure goal for 1961 has been established at $30 million.

The coming aerospace age will bring with it a wide use of exotic materials, far beyond the capabilities of current metalworking technique. To expedite fabrication it will be necessary to utilize the most advanced methods such as chemical milling, electronic erosion, spin forming and spin forging, plasmajet, explosive forming, high precision programming equipment, ultrasonic machining, etc.

Tolerances to Shrink

In addition, the Air Force believes that manufacturing tolerances will virtually disappear what with a probable requirement of tolerances of plus or minus 0.000006-in. This will certainly require equipment and methods far beyond the capabilities of any equipment in use today.

All this has an important bearing on the government-owned equipment that has been held for use by contractors, an inventory amounting to some $2 billion. Although the average age of such equipment is over 10 years, this does not mean that all is obsolete. There are jobs for which such equipment is economically suitable. However, the requirements of new weapons with their smaller tolerances and higher reliability characteristic make it imperative to take advantage of newer techniques.

It is significant that recent studies indicate that the utilization factor of conventional equipment for short run parts is considerably less than 40 per cent, whereas the

(*Turn to page* 96, *please*)

BRITISH V-BELT TRANSMITS GREATER POWER

Ferodo "Poly-V" belt is claimed to transmit more power than standard V-belt of same width and permits use of smaller, narrower pulleys for compact drive assembly. Flat belt is grooved with shallow ribs for larger contact area. Single unit can handle load normally requiring dual or triple drives.

Behind your production line

SEALED POWER—A PISTON RING FACILITY WITHOUT EQUAL

Mass production and strict quality control are important parts of our business, naturally. But even more important, we feel, are the independent solutions to your problems which our engineering and metallurgical staffs produce to further serve you. As another step to maintain this service, Sealed Power recently opened the newest and finest research and technical center in the piston ring industry.

Sealed Power is also noted for breakthrough engineering achievements which serve the entire industry. One such advance is our Stainless Steel oil ring—now widely accepted by the automotive segment of the reciprocating engine industry. This, and all Sealed Power contributions, are dedicated to our common cause—improving and refining the efficiency of the reciprocating engine.

Progress through Profits

Sealed Power Preferred Performance

PISTONS • PISTON RINGS • SLEEVES • SLEEVE ASSEMBLIES • SEALING RINGS FOR ALL APPLICATIONS

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN • ST. JOHNS, MICHIGAN • ROCHESTER, INDIANA • STRATFORD, ONTARIO • DETROIT OFFICE • 7-236 GENERAL MOTORS BUILDING • PHONE TRINITY 1-3440

Circle 135 on Inquiry Card for more data

MEN IN THE NEWS

Pittsburgh Plate Glass Co., Glass Div. — Laurence A. Keim has been promoted to manager of technical service-automotive sales.

Purolator Products, Inc. — Eugene B. Delaney has been promoted to manufacturing manager.

Calumet & Hecla, Inc., Wolverine Tube Div.—A. E. Nash has been promoted to director of operations.

Walker Mfg. Co.—Gene O. Hartnett has been named silencer product manager.

American Radiator & Standard Sanitary Corp., Industrial Div.—Emil F. Peslar has been appointed vice president-manufacturing.

Ford Motor Co.—Donald Pickles (far left) has been promoted to manufacturing and production engineering manager for the Metal Stamping Div., and George Bernard has been named manager, material forming and assembly department, Manufacturing Staff.

Chrysler Corp., Chrysler and Imperial Div. — **Henry L. Shuster** has been appointed assistant general sales manager.

Federal-Mogul-Bower Bearings, Inc., Bearings Co. of America Div.—**James A. Graham** has been named general manager.

B. F. Goodrich Co.—**Frederick W. Moyer** has been promoted to treasurer.

Goodyear Tire & Rubber Co.—**Walter E. Shively,** manager of tire engineering development, has retired after 45 years and has been succeeded by **M. A. Wilson.**

Eaton Mfg. Co. — **Malcolm Daisley** has been promoted to central industrial relations manager.

Electric Autolite Co., Bay City Div. —**Clarence A. Haut** has been named chief instrument engineer.

Ford Motor Co., Lincoln-Mercury Div.—**John H. Shoemaker** has been promoted to distribution manager.

Chrysler Corp., Dodge Div. — **Charles P. Noonan** has been promoted to director of sales promotion for Dodge cars and trucks.

General Motors Corp., Allison Div. —**Richard L. Coffey** has been promoted to manager of Los Angeles zone office.

Chrysler Corp., Stamping Group— **G. E. Nash** has been named comptroller and **F. S. Mitchell** and **D. A. Milton** have been appointed plant managers for the Mack ave. and Eight Mile stamping plants.

General Motors Corp., Central Foundry Div.—**Carl F. Joseph,** technical director, has retired after 43 years with General Motors.

Midland-Ross Corp., Cleveland Div. —**Russell G. Raffensparger** has been named plant superintendent.

Budd Co.—**Ernest R. Schmidt,** executive vice president, has retired after 43 year's service.

Ford Motor Co.—**Robert R. Cosner** has been named manager of Sterling Twp. chassis parts plant.

Bendix Corp.—**James B. Gordon** has been elected secretary.

United Aircraft Corp., Norden Div. —**Socrates N. Vavoudis** has been named supervisor of the environmental laboratory.

Goodyear Aircraft Corp.—**William J. Wells** has joined the Weapons Systems and Forward Projects Planning Dept.

Ford Motor Co., Ford Div.—**Douglas T. McClue** has been promoted to car sales promotion manager and **L. Jack Wright** has been named truck sales promotion manager.

J. I. Case Co.—**William B. Peters,** vice president, has retired after 50 years' service.

General Motors Corp., Central Foundry Div.—**Thaddeus Giszczak** has been promoted to chief metallurgist, a new position.

Tube Reducing Corp., Tube Div. — **Kenneth W. Donle** has been appointed works manager.

Necrology

Giuseppe M. Bellanca, 74, aviation pioneer who designed and built the first cabin monoplane in the United States and former president of the Bellanca Aircraft Corp., died Dec. 26 in New York.

Julius G. Solomon, 67, board chairman of Barry Universal Steel Corp., died Dec. 26 in Detroit.

Joseph A. Benoit, 69, a consultant for the Dura Corp., died Dec. 21 in Detroit.

James E. McPeak, 66, former office manager for the Buick Div. of General Motors Corp., died Dec. 19 in North Hollywood, Calif.

James W. Tiscornia, 75, president, general manager and cofounder of Auto Specialties Co., Inc., died Dec. 16 in St. Joseph, Mich.

Russell J. Wilt, 45, manager of the McCord Radiator Corp. plant in Plymouth, Ind., died Dec. 16 in Marysville, O.

(Advertisement)

RBW FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By Fred E. Graves

Fastening of "blind hole" joints

Holes which don't go all the way through a solid member must be tapped, of course. In shallow, small holes, in non-critical fastening, and in soft materials thread cutting screws work well and save time.

But fastening large flanges, pressure plates, heads and the like to costly castings needs more precise production. These holes are ¼" diameter and larger, affect design strength.

THREAD EFFECTS

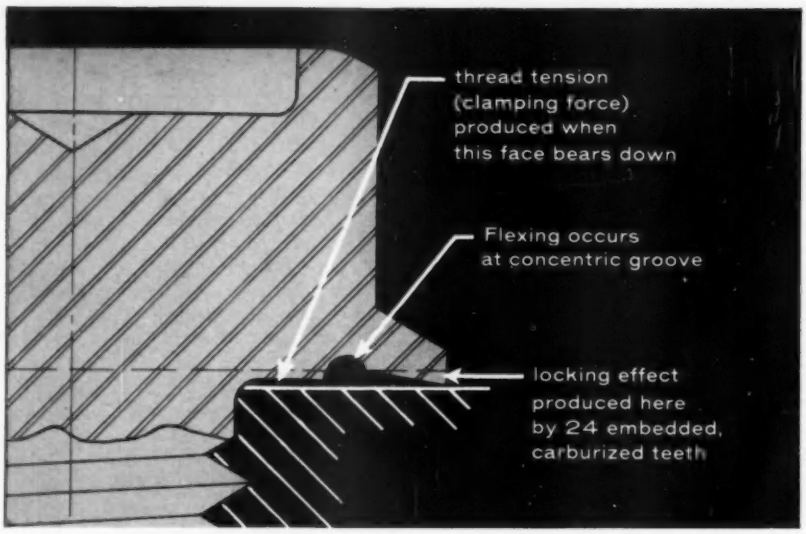
Such holes are coarse threaded. The coarse threads develop more thread strength than do fine threads, also take fewer turns in assembly. Studs go into the holes with an interference thread fit; hex screws with a simpler clearance fit.

Desirably, studs should all be driven to same depth and bottomed. Because of normal manufacturing differences, various mismatched high and low tolerances will cause studs to project unevenly. Assemblers often have to juggle. No such problem exists with hex screws. You just tighten to specified preload. And there's no double driving operation, as with stud plus nut.

STRENGTH OF BLIND JOINTS

Tapped holes behave like nuts. Their threads adjust elastically and plastically to distribute stress and develop high thread tension. Is this harmful in repeated disassemblies? Not at all. Hex screws have been installed 50 times in cast iron test blocks, then tightened to failure without damage to tapped holes.

Clamps like a hex screw Grips like an anchor


thread tension (clamping force) produced when this face bears down
Flexing occurs at concentric groove
locking effect produced here by 24 embedded, carburized teeth

Tensilock® screws offer you the ideal combination of high clamping force and high locking power.

While a standard high strength hex screw can be tightened to a higher thread tension, its off-torque is less than its on-torque.

ANCHORED IN PLACE

The *"Tensilock"* screw features ratchet action teeth formed at an angle which will cut driving effort to permit you to utilize more of the full strength of screw. At equal driving torque, it not only develops 90% of the strength of a high strength hex screw but also takes *25% more torque to loosen than to tighten.*

Because of the flange's concentric groove, it flexes, allows the screw to bear down solidly on its seat and develop a high level of thread tension. At the same time the teeth embed themselves, are aided in maintaining their grip by pressure of the spring-action flange.

MAKES GOOD FRICTION-TYPE JOINT

Clamping force from Tensilock fasteners is sufficient to prevent slippage of fastened members where holes are oversize or eccentric. Grip of the teeth keeps fasteners tight under conditions of vibration or cyclic temperature changes. RB&W *"Tensilock"* Nuts also available. Write for Bulletin TL-2. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, New York.

® Registered and Patented

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa., Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

an Editorial

A Cold, Hard Look at 1961

AT THE OPENING OF THE NEW YEAR, the political excitement of November faded into the background of events and some indicators of 1961 business trends came into view. One important general trend appeared self-evident. The outlook for automotive manufacturing continued to assure producers and suppliers that no major set-back loomed upon the horizon. There were the usual year-end reductions in manufacturing schedules, none of which were unanticipated by persons familiar with the industry's repetitive economic trends. There were the usual dire warnings of habitual gloom merchants whose morbid forecasts occur annually and have no resemblance to facts. There was good news in the fact that none of the gadfly critics of the automotive industries were elevated into positions of national industrial policy-making by the new administration.

GOSSIP ABOUT A NUMBER of future additional entries in the compact car competition was rampant. Some more important news was the actual introduction of a number of additional models of fully developed pasenger cars and trucks. The general outlook for truck sales was strong with some emphasis upon the bright outlook for sales to farmers. The year-end marked a general period of re-evaluation of production methods, materials and costs. There were indications that some important innovations in manufacturing have been planned for the first half of 1961. Many commodities had moved into more favorable buying levels. There were some indications that steel buying would improve. Certainly everyone has been aware of the "unfavorable" indicators.

A REALISTIC SUMMARY of the outlook was prepared by W. R. Timken, president of the Timken Roller Bearing Company. He said that 1961 may very well equal 1960 as a business year. . . . "I should expect that 1961 will start at the current low levels and then climb, gradually at first and perhaps strongly in the final part of the year."

POSSIBLY SOME ADDITIONAL REVIEW of the "favorable" indicators might be added. Government spending is increasing for defense, roads, schools and housing. Money supply is growing and interest rates are declining. National income is holding at high levels. Discretionary spending power of the public also is high. Consumer spending is high and well sustained. Exports have increased. Industrial inventories are in a more nearly normal condition and producers need commodities. Future consumer requirements will increase.

THE TOTAL MOBILITY NEEDS of the entire country have continued to climb. Motor transportation will be required to carry more passengers and freight over short and medium distances. For instance, try to route a convenient trip from Harrisburg, Pa., to Detroit. With some difficulty, it can be done by rail. By air transportation, it also is something less than a convenient trip. By passenger car, modern throughways now make this the most economical and convenient mode. Such an example is basic and significant. Not too long ago rail and air transport were more convenient than bus or passenger car. Obviously, for maximum convenience and economy, transportation users in 1961 will have more reasons than ever before for buying new cars and trucks to keep pace with their transportation needs. We also might remind ourselves that even during a recession, economical transportation is more essential to many people than in times of peak prosperity.

Harry W Barclay

Editor and Publisher

No matter what type of bearing — babbitt, sintered copper-lead, aluminum — McQuay-Norris makes 'em! And from our years of experience, you can be sure of that *something extra* in quality and performance.

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For stronger and longer bearing life, you can depend on McQuay-Norris bearings.

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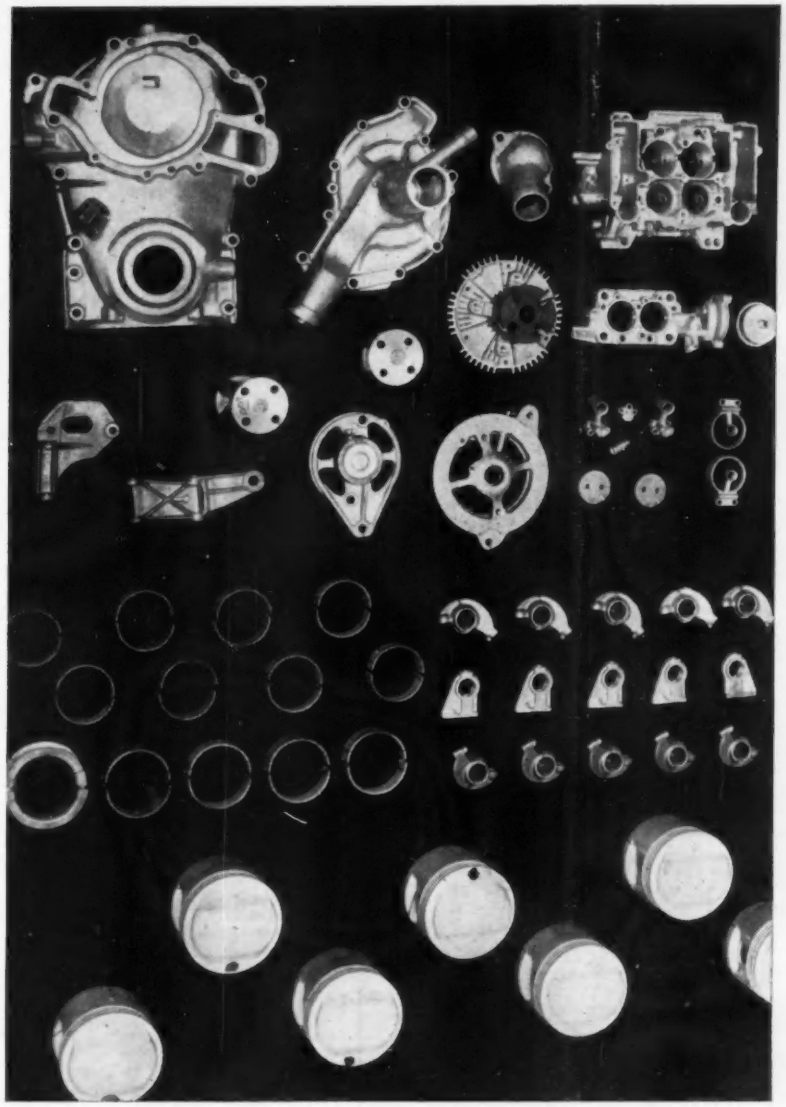


Much of the aluminum used in the new cars is hidden under the hood. Buick engine parts include front engine cover, carburetor housing, fuel pump cover and head, pistons, bearings, rocker arms and a variety of brackets.

ALUMINUM...

Front-Runner in Materials Derby

By

Norman M. Lloyd

MARKETS EDITOR

ALUMINUM makers, backstopped by intensive product development programs, have dipped into autodom's treasure chest and come up with a fistfull of applications that hold the key to new markets—both immediate and long range.

Although some producers are hedging in their optimism of again posting an annual industry increase of somewhere between 10 and 15 per cent, the use of light metal in cars is expected to reach an all time high during the 1961 model year. Bright spot is the cast aluminum engine which, according to recent estimates, represents an immediate increase in usage by 50 to 80 million lb.

TABLE I

AVERAGE POUNDS PER CAR

. . 1960 vs 1961 . .

CAR MAKE	LBS. PER CAR AV. 1960 (Actual)	1961 (Estimated)
American	31.7	37.5
Rambler	62.0	120.6
Ambassador	78.4	84.0
American Motors Corp.	55.3	98.4
Plymouth	67.8	63.7
Valiant	50.1	45.9
Dodge	75.5	74.6
Lancer	—	41.7
DeSoto	78.7	72.9
Chrysler	78.9	81.9
Imperial	92.1	82.9
Chrysler Corp.	68.7	63.3
Ford	59.8	60.5
Falcon	40.7	41.3
Thunderbird	54.8	70.5
Mercury	47.9	54.1
Comet	46.0	46.9
Lincoln	68.7	69.7
Ford Motor Co.	52.9	55.2
Chevrolet	42.4	44.8
Corvair	106.9	106.1
Pontiac	43.9	43.9
Tempest	—	40.6
Oldsmobile	43.8	52.2
F-85	—	134.9
Buick	69.1	70.3
Special	—	132.6
Cadillac	59.9	63.6
General Motors Corp.	52.3	64.5
Studebaker Packard Corp.	17.7	25.2
All Makes	54.4	62.1

Source: Kaiser Aluminum.

TABLE II

. . MODEL RUN OUTPUT . .

SHARE OF MARKET BY MODEL MAKE

With Estimated Aluminum Consumption Each Manufacturer

	Model Run Output 1960	% of Total	1961 Model Year (6 Million Units)	OA Estimated Usage Alum. per Mfr. (6 Million Units) 1961 Mod. Yr.	1961 Cal. Yr.
American Motors	—	7.84%	450	43,000	43,000
Rambler	332	5.53	400* A	—	—
American	126	2.11	—	—	—
Chrysler Corp.	—	14.87%	900	59,000	64,000
Chrysler Div.					
Chrysler	73	1.21	—	—	—
Imperial	18	.29	—	—	—
De Soto	24	.40	—	—	—
Dodge Division					
Dart	307	5.10	—	—	—
Dodge (Std.)	43	.71	—	—	—
Lancer	—	—	100*	—	—
Plymouth Division					
Plymouth	243	4.04	—	—	—
Valiant	188	3.12	200* Op.	—	—
Ford Motor	—	28.92%	1,750	97,000	100,000
Ford Division					
Falcon	436	7.20	400*	—	—
Ford (Std.)	911	15.15	—	—	—
Thunderbird	93	1.55	—	—	—
L-M Division					
Comet	116	1.93	200*	—	—
Edsel	3	.05	—	—	—
Lincoln	25	.41	—	—	—
Mercury	155	2.58	—	—	—
General Motors	—	46.48%	2,800	195,000	198,000
Buick	254	4.22	—	—	—
Buick Special	—	—	200* A	—	—
Cadillac	142	2.37	—	—	—
Chevrolet Div.					
Corvair	250	4.16	200* A	—	—
Chevrolet (Std.)	1,404	23.36	—	—	—
Oldsmobile	347	5.77	—	—	—
F-85	—	—	200* A	—	—
Pontiac	397	6.60	—	—	—
Tempest	—	—	100* Op.	—	—
Studebaker-Packard	—	2.09%	100	3,000	3,000
Hawk	4	.07	—	—	—
Lark	122	2.02	100*	—	—
TOTALS	6,011		6,000	397,000	408,000

Source: Olin Aluminum.

*—Indicates Compact Model
A—Indicates Aluminum Engine Block and Head
Op—Indicates Optional Availability, Aluminum Engines

In addition to the Corvair air-cooled engine, first introduced in 1959, two new aluminum powerplants made their debut last fall—American Motors' die-cast six (12.5 per cent silicone and no copper), and General Motors' semi-permanent mold-cast V-8 (7 per cent silicone and 0.25 copper).

Chrysler's die-cast slant six (8 per cent silicone and 3 per cent copper) is in production for Plymouth, Dodge Dart and Lancer with latest reports from Detroit indicating extended production schedules.

Although scattered reports of trouble with porosity and irregular densities have raised some eyebrows, there is no evidence that die casters have broken stride. GM's Central Foundry Division, producer of the cast block and heads for the Buick Special, Oldsmobile F-85 and the Pontiac Tempest (optional), has boosted production to 1000 blocks and 2000 heads per day.

Unpromoted is the fact that Chrysler has produced 3350 aluminum engines for the Lancer, with some 2750 already installed. All Lancers ordered with the larger 225 cu in. engine, dubbed the raised "G," will get the aluminum block.

An additional 6000 aluminum engines are ready for Plymouth and Dart with some 2500 installs in the former, and 2400 in the latter.

Doehler - Jarvis, volume die-caster for American Motors Rambler Classic six, is rolling along and expected to raise production sights during the coming months.

Production figures through December 17, 1960, show that aluminum-engined cars are still being rolled out at a good clip. Corvair totalled in at 248,467 units, Oldsmobile F-85 at 36,709 and Buick Special with 33,912.

Last reports from Detroit had the optional Tempest V-8 running at 1.4 per cent of production.

Potentials under the hood look even brighter. If the new crop of engines "make it" on the road and with the buyer, it's a good bet that more will be offered next model season. Some die casters see 4 million cars with aluminum blocks, cylinder heads and intake manifolds within the next five years.

"Bread-and-Butter" Gains

Although the engines have drawn the biggest promotional splash, many significant gains have been made in other areas.

Reynolds estimates that Ford, without an announced aluminum engine, will up average usage per car by at least 10 per cent over the 60.73 lb carried on last year's model. New applications range from three new aluminum torque converter housings (8, 9 and 10½ lb) to a tiny rear-view mirror support that weighs in the ounces.

According to Alcoa, transmission requirements for the light metal are up some 25 per cent, with Oldsmobile, Chevrolet and Pontiac using almost twice as much. Pontiac went over the top as the car registering the greatest one-year per cent jump in average aluminum usage—up 49 per cent over last year.

Chrysler's 7 lb cast-aluminum alternator-housing is now standard on all corporation's cars.

Now with a solid cake to cut up, producers haven't overlooked the frosting.

New gains are being racked up in decorative hardware and trim which has already climbed 600 per cent in a three-year period. Alcoa currently puts average at 10.76 lb per car, an increase of 25 per cent over 1960 models.

Twenty cars now feature either an extruded or stamped aluminum grille, and Chevrolet sports the industry's first aluminum belt-molding.

The decorative upper and lower panels across the trunk of the Oldsmobile are aluminum applique —4 lb worth.

Potentials Unlimited

With many hands on the trigger, the light metal industry hopes to touch off an exploding market by prodding automotive designers into further weight reductions in supporting structures, power-train components and unsprung weight.

Reynolds has already made production sample extruded bumpers in quantities from 12 to 250 units each for seven models of passenger cars. Still under wraps, the total market for this one application in the U. S. and Canada could run in excess of 150-million lb annually.

Suppliers are also looking around the corner for such long-nurtured images as aluminum radiators and integrally-cast wheel, hub and brake assemblies.

(*Continued on next page*)

TABLE III

PASSENGER CARS—ALUMINUM CONSUMPTION

Calendar Year Basis

Calculated Average Aluminum Weight per Component
Composite American Built Units

(Revised to Account for Light-Weight "Compact" Models as Now Made by All Five U. S. Producers)

	Auto Production Actual & Est.:	5,590,000 1959		6,300,000 1960		6.0–6,500,000 1961	
CASTINGS	Aluminum Weight of Part (Potential)*	%	lbs.	%	lbs.	%	lbs.
Pistons	11.0	100	11.0	97	10.7	95	10.5
Automatic Transmission Parts	22.0	76	18.0	75	16.1	70	15.4
Carburetor Parts	3.0	67	2.0	83	2.5	90	2.8
Intake Manifolds	7.0	12	.8	15	1.0	28	2.0
Power Steering Parts	5.0	43	3.0	40	3.0	40	3.0
Power Brake Parts	1.0	30	.3	40	.4	40	.4
Wheel and Brake Drum	65.0	3	2.2	5	3.3	7	4.5
Cylinder Blocks and Heads	100.0	1	1.0	7	7.0	15	15.0
Other Engine Components	5.0	40	2.0	60	3.0	80	4.0
Bumpers—Cast Type	5.0	Negl.		Negl.		Negl.	
(Impact Extruded Parts from Cast Slugs)			(1.0)				
TOTAL CASTINGS	219.0 (excl. cast bumper sections)	—	40.3	—	47.0	—	57.6
SHEET PRODUCTS							
Grille (Sheet Sections Only)	4.0	90	3.6	90	3.6	90	3.6
Exterior Trim	6.0	33	2.0	20	1.2	25	1.5
Head Lamps and Bases	1.0	50	.5	50	.5	50	.5
Hub Caps/Wheel Covers	4.0	10	.4	10	.4	Negl.	
Interior Trim	5.5	60	3.3	60	3.3	60	3.3
Accessories and Miscellaneous	1.0	30	.3	30	.3	30	.3
Radiators and Heaters	11.0	—	—	Negl.		Negl.	
(Bumpers) and Other	40.0 (excl. Bumper, 35 lbs.)	—	—	—	—	Negl.	
TOTAL SHEET	37.0 (excl. Bumper)	—	10.1	—	9.3	—	9.2
EXTRUSIONS & OTHER MILL SHAPES							
Exterior Trim, Including Grille	2.0	50	1.0	50	1.0	50	1.0
Cable and Misc., R. B. & W.	1.0	10	.1	10	.1	20	.2
(Bumper) and Other	20.0	—	—	—	—	Negl.	
TOTAL EXTR. RBW & OTHER	23.0 (excl. Bumpers)	—	1.1	—	1.1	—	1.2
TOTAL ALL PRODUCTS	253.0	—	51.5	—	57.4	—	68.0
		290 MM		362 MM		Lo: 408 MM Hi: 442 MM	

* Potential based on 100% Standard American Car Sizes Prior to Introduction of Compacts—Reduced Penetration Figures illustrate effects of compact acceptance.

Source: Olin Aluminum.

TABLE IV

USE OF ALUMINUM ON 1961 MODEL PASSENGER CARS

CAR	Estimated Production (Units)[1]	Lbs. per Average[2] Car	Total Lbs. (Thousands)
GENERAL MOTORS CORP.	2,463,000	67.09	165,233
Corvair	222,000	99.43	22,073
Chevrolet (incl. Corvette)	1,253,000	46.66	57,625
Tempest	69,000	42.85	2,957
Pontiac	281,000	66.69	18,740
Buick Special	63,000	137.11	8,638
Buick	159,000	100.90	16,043
F-85	69,000	158.74	10,953
Oldsmobile	238,000	72.00	17,136
Cadillac	127,000	87.15	11,069
FORD MOTOR CO.	1,531,000	53.02	81,166
Falcon	387,000	34.90	13,506
Ford	805,000	59.34	47,769
Thunderbird	79,000	79.74	6,299
Comet	133,000	37.06	4,929
Mercury	106,000	65.01	6,891
Lincoln	21,000	84.39	1,772
CHRYSLER CORP.	780,000	76.47	59,646
Valiant	200,000	57.10	11,420
Plymouth	180,000	88.69	15,964
Dodge Lancer	74,000	64.86	4,800
Dodge Dart	196,000	77.04	15,100
Dodge	42,000	90.32	3,793
De Soto	3,034[3]	87.79	266
Chrysler	68,966	98.50	6,793
Imperial	16,000	94.38	1,510
AMC (Rambler)	411,000	59.06	24,274
Studebaker (Lark)	110,000	21.13	2,324
Checker (Superba)	5,000	37.36	186
TOTAL	5,300,000	62.80	332,829

Notes:

[1]—Based on actual 1960 model and early 1961 model output percentages, plus adjustments for new cars and De Soto.

[2]—Average car refers to composite car body model with aluminum finished part weight distributed.

[3]—Final De Soto production.

Source: Aluminum Co. of America.

TABLE V

AVERAGE CAR USE OF ALUMINUM

Pounds per car—finished weight

CAR	1960 (Revised)	1961	% Change
GENERAL MOTORS CORP.	50.06	67.09	+32.4
Corvair	103.36	99.43	− 3.
Chevrolet	34.26	46.66	+36.2
Tempest	—	42.85	—
Pontiac	44.69	66.69	+49.2
Buick Special	—	137.11	—
Buick	78.49	100.90	+28.6
Oldsmobile F-85	—	158.74	—
Oldsmobile	54.21	72.00	+32.8
Cadillac	78.27	87.15	+11.4
FORD MOTOR CO.	48.69	53.02	+ 8.9
Falcon	35.74	34.90	− 2.3
Ford	54.30	59.34	+ 9.3
Thunderbird	64.39	79.74	+23.8
Edsel	54.90	—	—
Comet	40.04	37.06	− 7.4
Mercury	57.52	65.01	+13.0
Lincoln	84.03	84.39	+ 0.4
CHRYSLER CORP.	82.69	76.47	− 7.5
Plymouth	73.57	88.69	+20.5
Valiant	80.05	57.10	−28.7
Dodge	—	90.32	—
Dodge Dart	81.61	77.04	—
Dodge Lancer	—	64.86	—
De Soto	94.68	87.79	− 7.3
Chrysler	113.69	98.50	−13.3
Imperial	113.39	94.38	−16.8
AMC (Rambler)	48.85	59.06	+20.9
Studebaker-Packard Lark	17.55	21.13	+18.4
Checker	33.68	37.36	+10.2
TOTAL	54.39	62.80	+15.5

Source: Aluminum Co. of America.

TABLE VI

USE OF ALUMINUM IN PARTS OF CARS

Comparison—Pounds Per Car

CAR PART	1961	1960 (Revised)	1959	1958
Engine	20.20	18.99	15.75	15.51
Transmission	23.04	18.43	16.97	15.62
Hardware and Trim	10.78	8.36	10.16	8.95
Body	1.29	1.78	1.77	1.94
Electrical	2.98	2.50	1.72	1.94
Brakes (including power)	1.90	2.01	2.06	1.51
Steering (including power)	1.25	0.79	0.86	1.09
Air Conditioning and Heating	0.96	1.63	1.12	0.64
Air Suspension	—	0.11	0.15	0.11
Instruments	0.22	0.05	0.05	0.02
Miscellaneous	0.18	0.14	—	—
TOTAL	62.80	54.39	50.65	47.33

Source: Aluminum Co. of America.

No Unexpected Bonus

The intensity of market measurement by producers such as Alcoa, Reynolds, Kaiser, Olin and others clearly indicates that penetration of the automotive market is no unexpected bonus. Coupled with "wall-to-wall' product development, these organizations have quarterbacked the combination into a gain of approximately 50 lb per average car since 1948.

Although undisputed figures on aluminum usage are yet to come, the research represented in Tables I through VII and reported, in part, below, are notable examples of just how "tight" the market can be scouted.

Kaiser Aluminum's annual survey (Table I), estimates a per car increase of 14.2 per cent and forecasts the following:

TABLE VII

USE OF ALUMINUM IN 1961 MODEL COMPACT CARS

CAR	Estimated Production (units)	% of Total Compacts	% of Total All Cars	Lbs. per Av. Car	Total Aluminum (000 lbs.)	% of Total Aluminum Compacts	All Cars
Rambler	411,000	23.7	7.8	59.06	24,274	22.9	7.3
Falcon	387,000	22.3	7.3	34.90	13,506	12.8	4.0
Corvair	222,000	12.8	4.2	99.43	22,073	20.8	6.6
Valiant	200,000	11.5	3.8	57.10	11,420	10.8	3.4
Comet	133,000	7.7	2.5	37.06	4,929	4.7	1.5
Lark	110,000	6.3	2.1	21.13	2,324	2.2	0.7
Lancer	74,000	4.3	1.4	64.86	4,800	4.5	1.4
Tempest	69,000	3.9	1.3	42.85	2,957	2.8	0.9
F-85	69,000	3.9	1.3	158.74	10,953	10.3	3.3
Special	63,000	3.6	1.2	137.11	8,638	8.2	2.6
TOTAL	1,738,000	100.0	32.9	60.91	105,864	100.0	31.7
All Other Models	3,562,000	—	67.1	—	226,965	—	68.3
GRAND TOTAL	5,300,000	—	100.0	62.80	332,829	—	100.0

Source: Aluminum Co. of America.

● Based on automotive production of 6 million units, the estimated net or finished weight of aluminum components will average 62.1 lb per car compared to an actual net usage of 54.4 lb per car during 1960.

● Total net usage by the industry is expected to reach 379 million lb.

● Aluminum engine blocks will boost average net functional usage by 7.7 lb per car.

● The new aluminum - engine powered economy-cars will lead all models in usage—106 to 134 lb per car.

Olin Aluminum (Tables II and III) expect that penetration of the engine market will increase usage by 80 million lb, and total about 100-million lb. Estimating a production level of 6.3 million cars, the company pegs total consumption at approximately 428 million lb.

Both estimates represent weight of finished parts as manufactured for the original equipment market. Replacement parts and accessories are figured to reach 40 to 60-million lb.

Alcoa's annual industry - wide survey of where the aluminum is going (Tables IV, V, VI, and VII) points up the following:

● The 1961 car contains an average of 62.8 lb of aluminum.

● The 1960 actual aluminum usage per average car is 54.4 lb.

● A total of 332-million lb of aluminum will be required if a production estimate of 5.3-million cars is realized.

● The 1961 "heavyweight" is the Oldsmobile F-85 with 158 lb of aluminum.

● Corporate leader in aluminum is Chrysler with an average of 76.47 lb per car.

● Pontiac is the car showing the greatest annual per cent increase in usage—from 44.69 lb in 1960 to 66.6 lb in 1961. ■

Bendix Developments

Bendix Corp. has announced five new developments that are "in a state of readiness for use" on passenger cars and trucks. Four of the developments involve controls, the fifth is a constant velocity universal joint.

Bendix engineers have developed a "pedal-less" system for cars and trucks that uses a segmented floor board in place of conventional accelerator and brake pedals; a new variable ratio power steering system; a full-hydraulic "split" system for heavy-duty truck brakes; and a propeller shaft emergency brake for trucks.

The "pedal-less" floor board features minimum travel segments for foot control. The accelerator segment travels only 1⅛ in., and the full power brake segment travels only ⅛ in.

The power steering system, called Varamatic, features a variable ratio gear that gives a 22-25 to one ratio in center position, with a drop to as low as 12 to one for full right or left.

Bendix has been working more than seven years on the heavy duty air-actuated hydraulic brakes, which feature two actuating cylinders in each brake, and a split hydraulic system that gives each brake cylinder separate power.

The new spring actuated emergency brake provides braking entirely independent of the regular system. The emergency brake uses one brake at the front of the prop shaft and one at the rear. Bendix claims this system has halted a 60,000 lb. truck from 60 mph without the use of wheel brakes.

Bendix says its new universal joint is "expected to solve many of the problems" encountered in front-wheel-drive automobiles. Bendix president Malcolm Ferguson said one of the corporation's European licensees is tooling up for "volume production" of the constant velocity universal joint within a year.

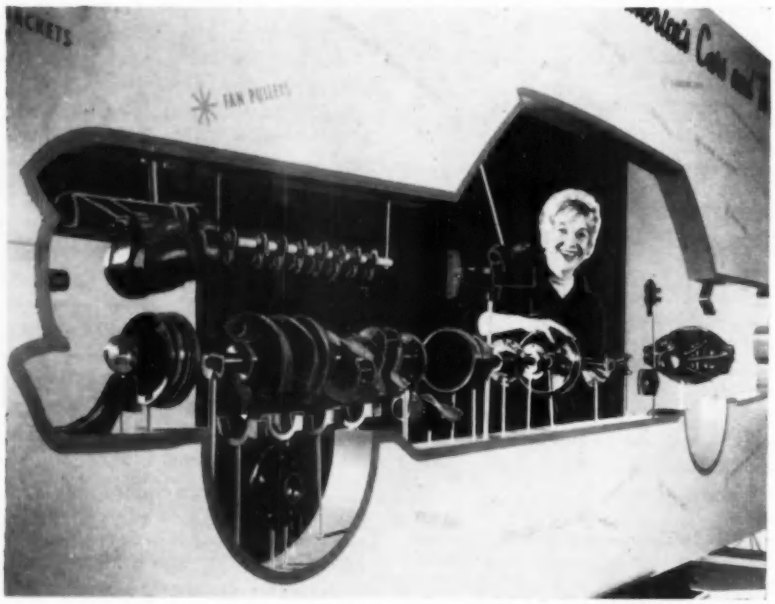
3-Wheelers Taxable

Three-wheel trucks designed for light hauling are taxable as regular trucks even though they have some characteristics of motorcycles, the Internal Revenue Service has ruled.

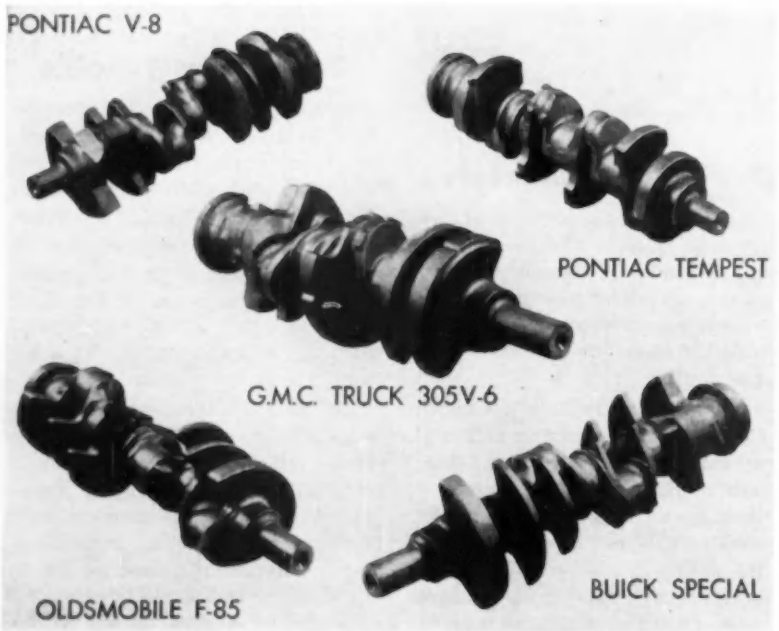
The IRS says the fact that "a vehicle has less than four wheels or that it has some of the other characteristics of a motorcycle" does not make it exempt from the tax.

At issue is a three-wheeled truck, with a four-cycle, one-cylinder, air-cooled engine and a power train consisting of a disc clutch, three-speed transmission, and a shaft drive connected to an automotive-type differential. Steering is by handlebars and a shaft connected directly to a fork in which the single front wheel is mounted.

Malleable Iron *Posts New Gains*



Typical malleable parts for passenger cars include steering gear housing, rocker arms, motor mount, fan pulley and hub, crankshaft, bearing caps, door hinges, transmission gears, driveshaft yokes, differential housing and case.



General Motors' line up of production malleable crankshafts.

Average 1961 Car Carries Over 100 Lb of Malleable Castings

On the strength of new automotive applications, malleable iron has broken loose for important gains. On some of the new makes and models, specifically those which have adopted pearlitic malleable crankshafts, the use of malleable iron has reached record levels.

The Oldsmobile F-85 sedan, equipped with power steering, has 164.5 lb of malleable castings; the Buick Special, similarly equipped, carries 154 lb. The average weight of malleable for the entire model line of these two makes is 152 lb and 132 lb, respectively.

A new area of application for malleable was created by the unique two-piece driveshaft used on all Buick models and the Oldsmobile F-85. Two malleable iron yokes join the split shaft to the constant-velocity universal joint. Malleable yokes also are used to join the shaft ends at the transmission and differential.

The cast malleable differential carrier of the Special, F-85, Valiant, Lancer, Falcon and Comet now serves as a backbone of the axle as well as a housing for the drive system. To form the axle, tubular steel extensions are pressed into openings on the side of the casting to form an oil-tight fit. On some makes, puddle welds are used to prevent rotation of the tubes.

The success of malleable iron in the automotive market place was greatly influenced by development of pearlitic grades which are

Tubular steel extensions cold pressed into malleable iron differential carrier of Ford Falcon eliminate banjo housing. Fit is oil tight.

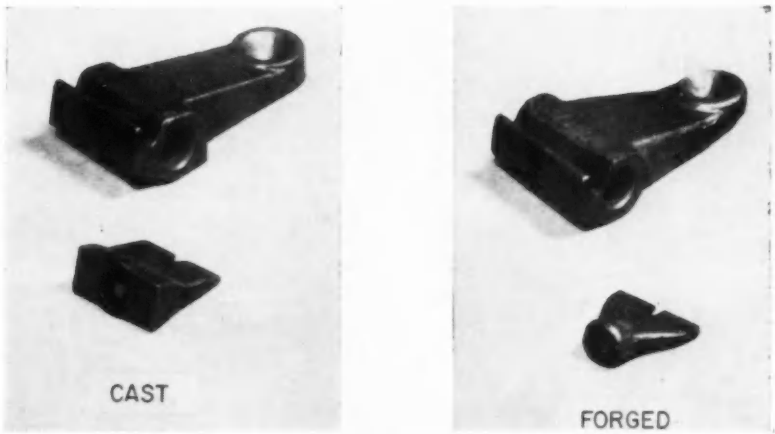
superior to ferritic in hardness and "wearability." Since World War II, pearlitic has grown from a specialty offered by a few foundries to a $60 million annual business for some 35 producers. Its annual growth rate over the last 15 years has been a spectacular 40 per cent.

Major breakthrough in malleable casting technology came with the introduction of a cast crankshaft for the 1956 Pontiac. With now over two million in service, malleable cranks are now standard on the Pontiac line. Last year, pearlitic cranks were used on General Motors Truck and Coach Div's new 305 cu in. truck engine, and now are used in the little Buick, Oldsmobile and Pontiac Tempest.

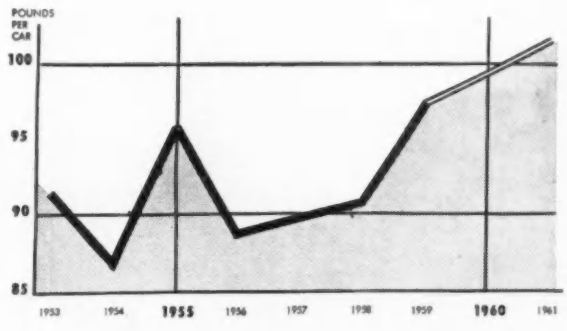
All five are cast in green sand mold at GM's Central Foundry Div. at Danville, Ill. James H. Smith, general manager, gives two reasons for the growing use of pearlitic malleable crankshafts,—cost and design freedom. "These cranks offer several advantages over steel forgings," Mr. Smith points out. "They have better machinability, lower initial cost, and allow more flexibility in designing the shape and location of the counterweights."

The latter is important. The smaller cars mean smaller engines and smaller crankshafts. As the distance between counterweights becomes tighter, casting becomes more advantageous because forging tools need certain minimums of bulk to retain their strength and sufficient draft to permit withdrawal. In the sand mold, draft can be less, and spacing determined by engine design rather than tool requirements.

Malleable also has broken loose for large gains in the automotive air conditioning market. Compressor makers, such as Borg-Warner, use pearlitic malleable for crankshafts because of its strength, fatigue resistance and good bearing properties. Malleable also is used for compressor heads, brackets, socket plates, mounts and other components. ■



Formerly forged steel, Chrysler now uses cast malleable transmission low-reverse band lever (top of illustrations) and kick-down anchor (bottom of illustrations). Hot coining reduces machining operations.



Calendar year production of malleable iron and calendar year production of passenger cars graphically illustrates the increased use, pounds per car.

1961 CHRYSLERS Use Plastic Foam Gaskets

APPLICATIONS of polyethylene foam as a gasket material have increased from a half-dozen in 1959 and 1960 Chrysler Corp. cars—to more than 30 in 1961 models.

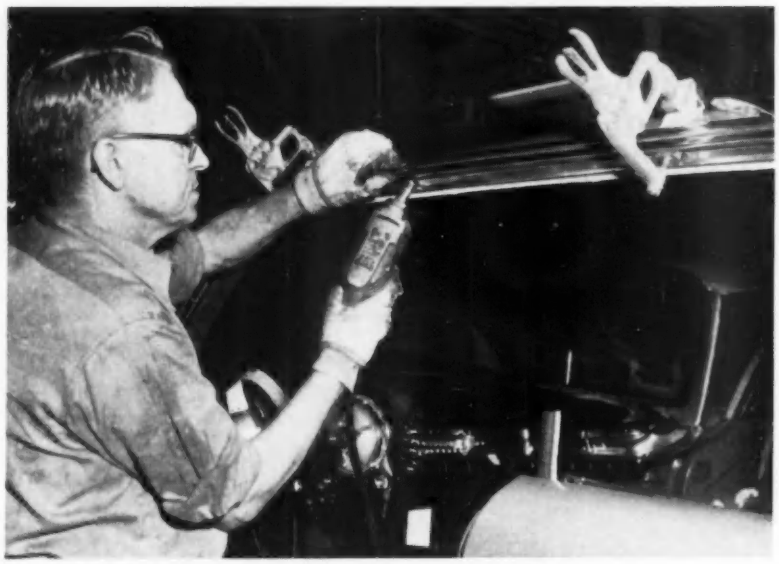
This low-cost, closed-cell "sponge' material is apparently proving to be a most desirable new product for body gasket seal use. It is reported to be highly-resistant to moisture, ozone, and hydrocarbons, and to have favorable application characteristics including low friction, rigidity, and compressibility. It is also clean to handle since use of mastic body sealers on fixed glass weatherstrips has been eliminated.

The low friction surface of cellular polyethylene permits the insertion of sheet metal screws directly through the material with no prealigned holes. For bolts, a guide hole is required in the gasket, but the hole can be smaller than the bolt diameter with no resultant tearing. Improved sealing is thus claimed.

Because of its low density, the material may, under high bolt torque, be compressed to 1/30th of its original thickness. Irregularities of surfaces such as between assemblies and the firewall, are therefore filled and sealed. The material is stated to show negligible compression loss with aging under these conditions—and consequently bolt loosening is not evident.

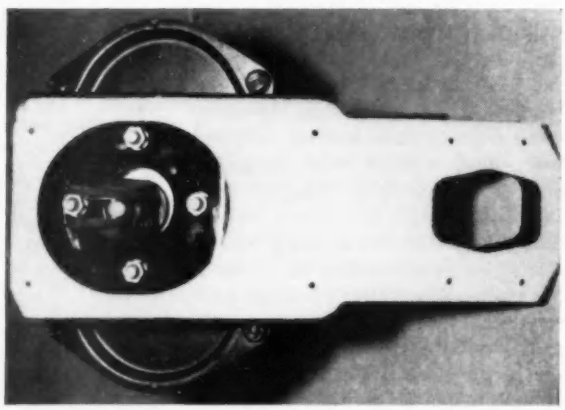
On the Valiant, polyethylene foam gaskets are being used for the rear quarter window seal, windshield wiper pivot seal, tailgate trim panel water seal, and as a fuel-filler-tube-to-the-quarter-panel seal. They also are being used in other models as heater gaskets and on miscellaneous trim. Typical applications are pictured in the accompanying illustrations.

Polyethylene foam is made by The Dow Chemical Co. and sold to fabricators under the trade name Ethafoam. It is supplied to fabricators in the form of planks. Fabricators skive these to thin slices, which in turn are die cut to the required gasket sizes. ■



Roof rail header molding assembly, with Ethafoam backing, is secured in place by driving screws through the metal and plastic foam.

Ethafoam washers are placed over retaining screws of Imperial windshield header moldings.



Seal between firewall and power brake master cylinder, requiring high torque retention.

EXPENDITURES on RECREATIONAL BOATING at All-Time High in 1960

Sales of Boats and Outboard Motors Lower, But Overall Spending Was Two Per Cent Higher than in 1959—and Inboard Engine Sales Increased. For 1961, Engine Prospects Are Reasonably Good.

By Charles A. Weinert
EASTERN EDITOR

ORDER bookings for new boats and engines were not as favorable in 1960 as those in 1959. Nevertheless, a record dollar volume of $2.525 billion (estimated) was spent at the retail level during 1960 on recreational boating—versus 1959's $2.475 billion.

Dollar shipments of recreational craft for the first eight months of 1960 had an index value of 135.7 (1957 = 100.0). For the full year 1959 the index value was 159.5. For 1958 it was 118.9.

Overall sales of new marine engines likewise declined—to the extent of about 20,000 units. However, inboard engines actually posted a 30 per cent numerical gain. The full brunt of the decline was taken by outboard motors—to the extent of 30,000 units.

Despite the drop-off in new equipment sales during 1960—which some people in the industry attribute to a re-adjustment or stabilizing period after rapid growth since 1954, aside from general economic conditions—the year 1960 was not too bad from a business standpoint. For example, dollar shipments of boats in 1960 exceeded those in every other year except 1959. And increased services along with the equipment sales raised industry expenditures to the record level.

The foregoing are some of the major aspects of the recreational boating industry viewed in estimated statistics jointly compiled and just issued by the National Association of Engine & Boat Manufacturers and the Outboard Boating Club of America. Additional details follow:

The 1960 Record

In the estimated total of $2.525 billion spent last year on all phases of recreational boating, $442 million was included for the purchase of new outboard boats, motors and boat trailers. This latter figure comprised $243 million for outboard motors, $165 million for outboard boats, and $34 million for boat trailers. It compares, in total, with expenditures for outboard equipment of $466 million in 1959 and $419.8 million in 1958.

Last year, an estimated 8.025 million recreational boats existed on all U. S. waterways. In this total were 842,000 inboard motor boats (including auxiliary-powered sailboats); 4.14 million outboard boats; 516,000 sailboats; and 2.527 million rowboats, canoes, dinghies, prams and miscellaneous craft, some used with outboard power. In 1959, for comparison, the total number of recreational boats in use was estimated at 7.8 million.

Participants in recreational boating rose from 39 million persons in 1959, to 40.125 million in 1960.

A total of 964,000 inboard gasoline and Diesel marine engines were in service in 1960, including converted automotive engines. During the year, inboard engine production was 48,300 gasoline engines (including about 15,000 converted automotive engines), and 6700 Diesels. Production of new gasoline engines, exclusive of the conversions, was up from 28,000 in 1959 to 33,300 in 1960—or an estimated increase of 5300 units. Diesel engine production rose substantially —from 2800 in 1959 to the 6700 in 1960, or a net increase of 3900 units.

Outboard motors in use last year are estimated at 6.05 million, including 510,000 new units sold in 1960. The 1959 total in use was 5.845 million, including 540,000 sold in 1959.

Boat trailers, both homemade and factory-produced, in use last year are computed at 1.8 million—up 50,000 from 1959.

Gasoline consumption in 1960 rose 57 million gallons over 1959—from 490 million to 547 million gallons. Outboard boats consumed 387 million gallons of gasoline, and inboard boats consumed 160 million gallons during the year.

Diesel fuel consumption for last year was 25.5 million gallons, versus 24.5 million gallons in 1959.

Lubricating oil consumption during 1960 has been estimated to total 25.2 million gallons—21.5 million gallons in outboard boats, 3.2 million gallons in gasoline-powered inboards, and 500,000 gallons in Diesel-powered boats. For 1959 the total was 25.5 million gallons. The overall drop of 300,000 gallons is attributed to the reduced lubricating oil needs of the newer outboard motors.

Usage of reinforced plastics (fiber glass, resin, pigments, fillers, etc.) in the manufacture of plastic boats and motor covers, as well as for repair, went up very considerably. Poundage for 1960 is estimated at 90 million, compared to 75 million for 1959 and 36.9 million for 1958.

Aluminum usage in 1960, for the fabrication of boats and engines, is figured at 70 million lb—made up of 50 million lb for inboard and outboard engines, and 20 million lb for boats. The 1959 total was 50 million lb; and the 1958 figure 47 million lb.

Statistics for the period 1947 to 1960 inclusive—on retail expenditures, recreational boats in use, and dollar shipments of boats, as well as on outboard motors, boats and trailers—are contained in the accompanying tabular data.

RETAIL EXPENDITURES ON BOATING*

1947-1960

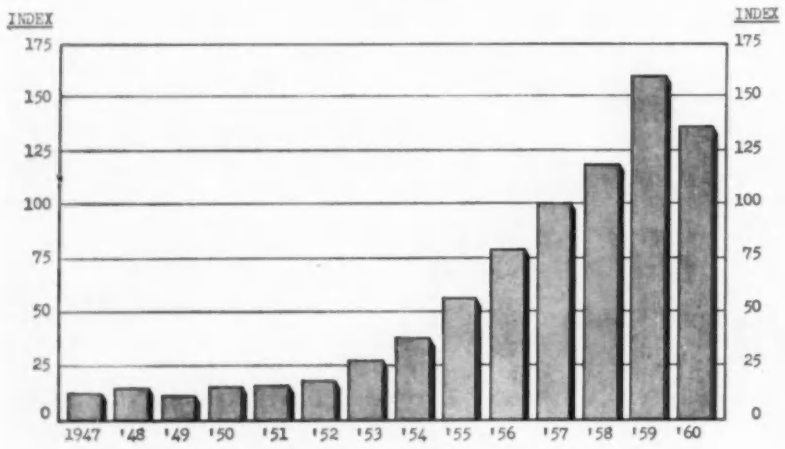
1947	$ 905,000,000
1948	780,000,000
1949	660,000,000
1950	680,000,000
1951	645,000,000
1952	720,000,000
1953	950,000,000
1954	1,000,000,000
1955	1,230,000,000
1956	1,580,000,000
1957	1,912,000,000
1958	2,085,000,000
1959	2,475,000,000
1960	2,525,000,000

* Estimated expenditures at retail level for new and used boats, engines, accessories, safety equipment, fuel, insurance, docking, maintenance, launching, storage, repairs, and boat club memberships.

Source: National Association of Engine and Boat Manufacturers, and Outboard Boating Club of America.

INDEX OF DOLLAR SHIPMENTS OF RECREATIONAL CRAFT

(1957—100.0)



1960 Based on Figures for First Eight Months

Source: National Association of Engine & Boat Manufacturers.

1961 Forecasts of Engine Makers

The views of marine engine manufacturers on the business outlook for the Year 1961 are conservative. They undoubtedly reflect uncertainties about the whole economic climate that is apt to prevail

throughout the year—in common with the nation's economists. In general, however, the engine makers are optimistic—feeling business will be just as good as, or perhaps even better than, in 1960.

Typical comments about business prospects, contained in special reports to AI from various engine builders, are quoted in the following:

Sam C. Spink, director of sales and advertising, Gale Products—"The industry experienced fewer sales in boats, motors, and trailers in 1960 than in 1959. The degree varied from manufacturer to manufacturer. Although we have planned a slight increase for sales in 1961, we see no reason to believe that sales in 1961 will be much different from the past year."

H. R. Nelson, supervisor of direct sales, West Bend Aluminum Co.—"West Bend is looking very optimistically towards the 1961 selling season. We as a company have two built-in advantages over some competitors in that we do have an all-new 80-hp motor for 1961 and are continuing in our growth program."

H. J. McCaully, general manager, Ballantine Industries—"The marine industry in 1960 went through a re-adjustment period as a result of a rapid growth in pleasure boating since 1954. As a result, sales of marine engines did not reach the peak of 1959, which was the industry's best year. From all indications, provided there are no adverse economic factors, 1961 should equal or exceed the top year of 1959."

Charles V. High, sales promotion manager, Chris-Craft Corp.—"We anticipate that our Marine Engine Division's business for 1961 will be every bit as good as it was in 1960, and probably better."

J. L. Keyes, director of sales services, Cummins Engine Co., Inc.—"The market outlook for 1961 looks firm, with some improvement being forecast in certain areas based on a season of successful fishing. We are continuing in the development of lighter-weight Diesels and in the reduction of the package size."

RECREATIONAL BOATS IN USE
1947-1960

1947	2,440,000
1952	4,333,000
1956	6,686,000
1957	6,954,000
1958	7,330,000
1959	7,800,000
1960	8,025,000

Source: National Association of Engine and Boat Manufacturers, and Outboard Boating Club of America.

Fred Alter, Dearborn Marine Engine Div., Eaton Mfg. Co.—"The outlook for '61 remains good. While there was a slight recession in some phases of the marine industry, the inboard marine engine business and the business of our customers, primarily manufacturers of inboard boats, fared pretty well. For the coming year, we look forward to sales at least equal to 1960, with the possibility of an increase due to our introduction of inboard-outboard power plants and bob-tailed engines for turbine propulsion."

Frank J. Hekma, vice-president, The Palmer Engine Co. — "Our business enjoyed a 25 per cent increase in sales in 1960, and we expect to maintain this increase in 1961. We expect to increase our sales to quality boat builders, commercial operators, and in the repowering field, but to lose some sales to the mass stock boat builder."

E. G. Henderson, vice-president and general sales manager, Universal Motor Co.—"In our opinion, the sales prospects for inboard marine engines for 1961 look very bright. A very marked trend from outboard to inboard has been developing over the past year or so, and indications are that it will gain momentum in 1961."

Harry J. Lemmer, advertising manager, Waukesha Motor Co.—"Marine engine business in 1961 is expected to exceed the volume of 1960 in the workboat field because of the steady growth of the industry and the continued trend in re-powering existing vessels with more-powerful engines."

1961 Engines

The new *outboard motors* being offered by the various manufacturers this year are described and illustrated in Part I of the article which starts on the next page. (Part II, to be published in a forthcoming issue of AI, will contain data on the new *inboard engines*, as well as inboard-outboard combinations.)

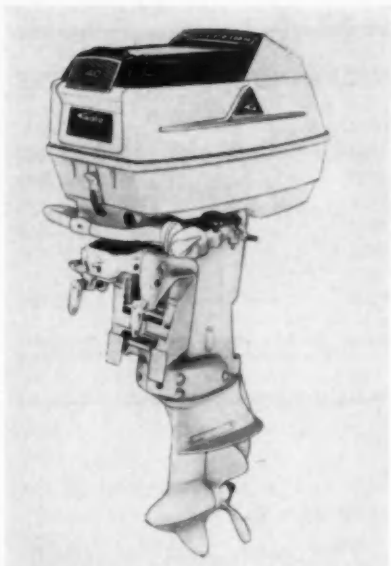
OUTBOARD MOTORS, BOATS, AND TRAILERS
Estimated Sales, By Years—1947-1960

Year	Outboard Motors: Unit Sales	Outboard Motors: Avg. Hp.	Outboard Motors: Total in Use	Outboard Boat Sales	Boat Trailer Sales
1947	584,000	4.7	1,857,000	143,000	3,780
1948	499,000	5.2	2,321,000	198,000	5,700
1949	329,000	6.4	2,643,000	171,000	8,285
1950	367,000	6.9	2,811,000	131,000	18,390
1951	284,000	8.9	3,010,000	154,000	20,360
1952	337,000	8.4	3,219,000	164,000	39,220
1953	463,000	9.0	3,419,000	231,000	72,000
1954	479,000	10.3	3,740,000	223,000	103,000
1955	515,000	12.9	4,210,000	258,000	129,000
1956	642,000	14.2	4,740,000	302,000	151,000
1957	550,000	16.3	5,140,000	320,000	165,000
1958	504,000	20.7	5,485,000	316,000	178,000
1959	540,000	23.7	5,845,000	329,000	188,000
1960*	510,000	27.4	6,050,000	300,000	160,000

* Preliminary estimates.

Source: Outboard Boating Club of America.

Evinrude's new 75-hp Starflite III outboard is a V-4 motor of 89.5 cu. in. displacement. Fixed high-speed carburetor jets and additional sound-silencing provisions are new features. This model with Uni-Charger adds an alternator to battery ignition.



The Gale Sovereign 40 Electric, replacing the prior 35-hp model, is a two cylinder motor with a total piston displacement of 43.9 cu in. It is rated 40 hp at 4500 rpm. This new electric-starting model has a 12-v system; and weighs about 133 lb.

Johnson's Super Sea Horse V-75A outboard motor, rated 75 hp at 4500 rpm, is equipped with a transistor-regulated alternator-type generator. Other new features are fixed high-speed carburetor jets, and safety interlock switch for starting in gear.

1961 MARINE ENGINES

Display Marked Advances in Design

DESIGN-WISE, the builders of outboard motors and inboard marine engines have made important contributions in developing and presenting their 1961 models.

Many of the new engines are being publicly displayed for the first time at the 51st National Motor Boat Show—now in process (Jan. 14-22) in New York's Coliseum.

The top rating for all the outboard motors at 80 hp, same as last year, seems to have halted the "horsepower race" in this field—at least for the time being. On the other hand, one of the makers has boosted the output of his biggest motor from 60 to 75.2 hp. And another builder has come out with a new 80-hp motor, doubling his last year's high offering of 40 hp.

Outboard improvements, beyond entirely-new styling, include more of the smaller, streamlined underwater configurations for lessening drag; refined carburetion with added use of fixed-high-speed-jet carburetors; and almost universal use of alternators for battery-charging on the large electric-starting models. Single-lever remote controls also are more universally available.

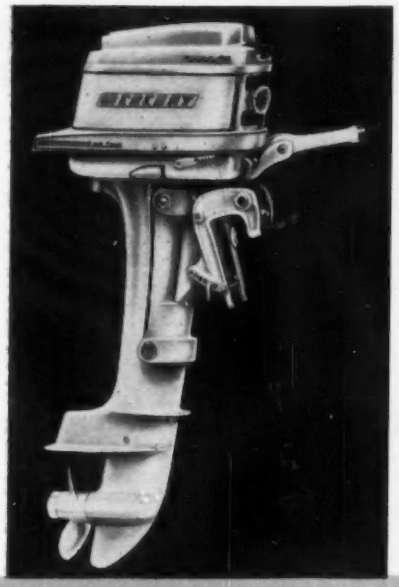
In the following are condensed descriptions of the outboard models unveiled by various of the builders for the 1961 market. The new inboards will be described in an early issue of AUTOMOTIVE INDUSTRIES.

Evinrude Motors

With ratings from 3 to 75 hp, the power range of Evinrude's 1961 re-styled outboard motors is the same as last year. A host of refinements, however, have been incorporated in the new models.

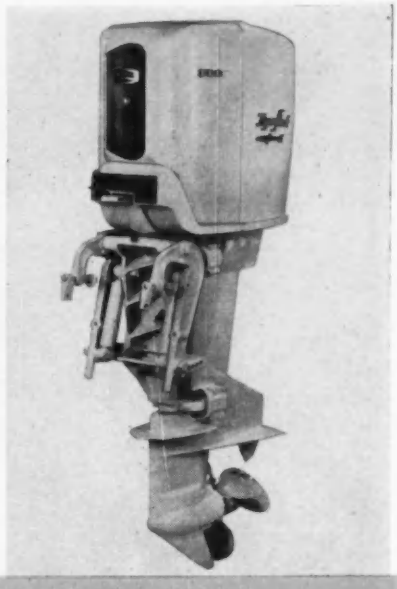
Leading the line is the 75-hp Starflite III, offered in two versions. The deluxe version, called Starflite III with "Uni-Charger," has battery ignition and a new 20-amp alternator with transistorized voltage regulator. The other 12-v electric-starting model has a distributor-type magneto, and is available optionally with a d-c generator. Weights are 240 and 220 lb, respectively.

The Starflite III's have a bore of 3⅜ in. and a stroke of 2½ in., for a total piston displacement of 89.5 cu in. They are four-cylinder V-type; and, of course, two-stroke.



Mercury's 6-hp Merc 60 is a new fishing motor for 1961. Of 7.2-cu-in. displacement, it has full gearshift, safety clutch (no shear pin), provision for remote control, and underwater exhaust. This is the smallest model in the Mercury line, which ranges up to 80 hp.

The Flying Scott is a three-cylinder 63.27-cu-in. outboard, now rated 75.2 hp at 5200 rpm—up 15.2 hp over last year's model. It weighs 168 lb. Three carburetors are used, one for each cylinder. It is electric-starting, with battery ignition and alternator.



West Bend's all-new 80-hp Tiger Shark "800" has four cylinders in line and a piston displacement of 84.36 cu in. Weighing 212 lb, it is equipped with separate battery ignition for each cylinder and a 20-amp alternator, as well as with two twin carburetors.

Both are rated 75 hp at 4500 rpm. New this year are fixed high-speed jets in the twin-barrel downdraft carburetors, combined with automatic chokes and thermostatically-controlled recirculating cooling systems.

Quieter operation has been attained by lining the motor covers with cellular sound-absorbent material. In addition, the air inlets have been redesigned with absorbent-lined S-shaped flow passages. Also, the electrical safety interlock switch has been relocated to permit starting in gear at low throttle settings only. The V-4 Starflites are equipped with two-way hydraulic shock absorbers.

Next in the line is the Lark III, Evinrude's electric-starting 40-hp model of 43.9-cu-in. displacement in two cylinders—followed by its 40-hp manual-starting counterpart, the Big Twin. Both likewise have thermostatically-controlled recirculating cooling systems, and are fitted with the new fixed high-speed carburetor jets. The Lark III also has an automatic choke.

Dash panels for the 75 and 40-hp electric-starting Evinrudes now include a red motor-temperature warning light. On the Starflite III with Uni-Charger, a green indicator dash lamp lights when the key switch is on.

Other 1961 Evinrude models are the 18-hp Fastwin, the 10-hp Sportwin, the 5½-hp Fisherman, and the 3-hp Lightwin.

Gale Products

For 1961, Gale has introduced a new 40-hp motor, available both in electric and manual starting models, replacing the prior 35-hp series.

The new Sovereign electric-starting "40" and its companion the Buccaneer "40" are rated 40 hp at 4500 rpm. Weighing 133 and 125 lb respectively, they are two-cylinder units with bores of 3 3/16 in. and strokes of 2¾ in., giving total piston displacements of 43.9 cu. in. The Sovereign model has 12-v electrical system, with key switch starting. Generator is optional.

Still heading the Gale line is the V-Sovereign, a V-4 of 70.7-cu-in. displacement, rated 60 hp at 4500 rpm. This unit weighs 205 lb. It has a thermostatically-controlled cooling system. Base model is electric-starting, although a manual-starting version also is available. Underwater "torpedo" structure, quick-disconnect electrical system, and universal motor mounting bracket are other features.

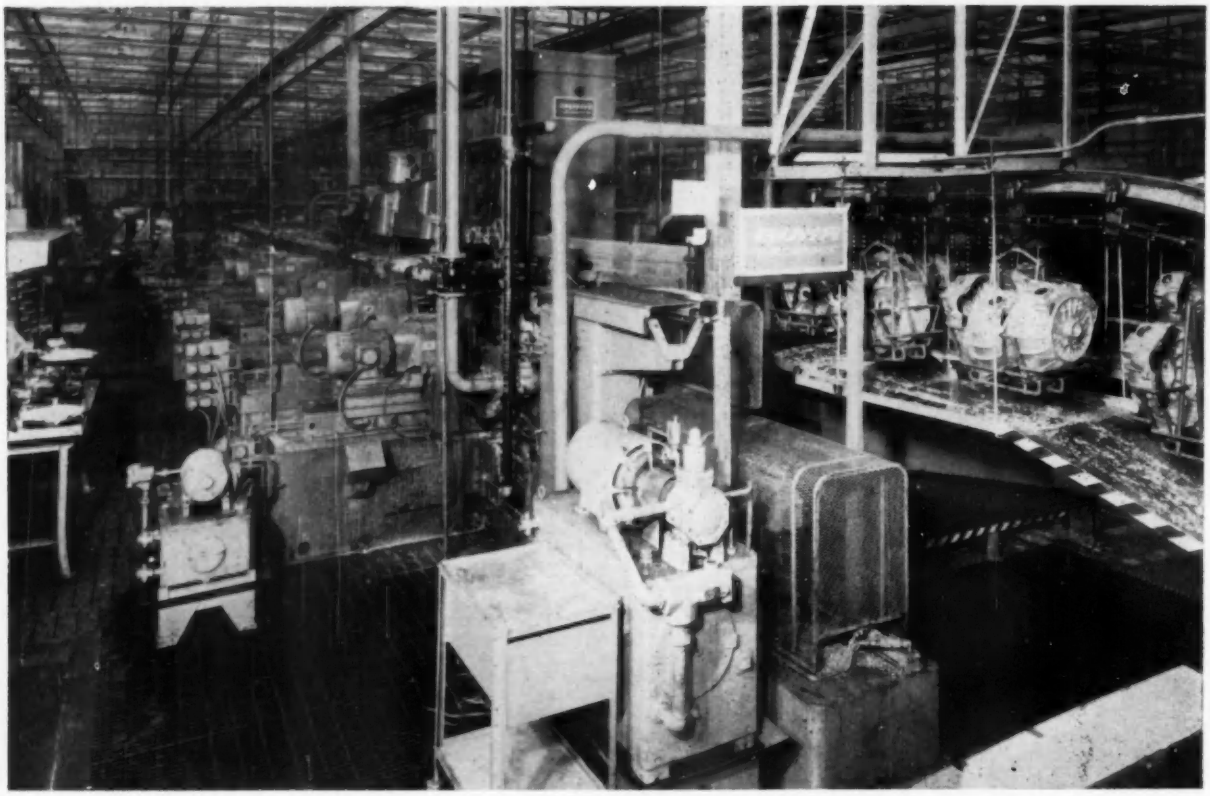
Rounding out the Gale series are five additional Buccaneer models. The 25-hp, two-cylinder, having a displacement of 35.7 cu in., is likewise obtainable in electric as well as manual-starting versions having weights of 127 and 119½ lb. Additional models are the twin-cylin-

(*Turn to page 92, please*)

PART I

By Charles A. Weinert

EASTERN EDITOR



Here, in perspective, is the 67-station Buhr Economatic transfer machine for machining the large cover, similar to a flywheel housing, seen on the conveyor at the right. Due to the size of the part, the initial turning, facing, and boring operations are performed in two-spindle Heald Model 352 precision-boring machines; with finishing by another battery of Healds at the end of the line. Parts flow to this machine is by means of the overhead conveyor coming in from the right.

Aluminum Transmission Case Covers Machined on Transfer Machines

Detroit Transmission Division Employs Three Different Makes of Automated Machines in Processing Similar Parts

By Joseph Geschelin
DETROIT EDITOR

ONE corner of the immense complex of the HyraMatic transmission manufacturing operation of GMC's Detroit Transmission Division at Willow Run is devoted to the machining of three different die-cast aluminum transmission case covers. Although quite similar in outward appearance, each of these covers is of a different size and one of them is more like an adapter, i.e. it is not as deeply dished.

What is noteworthy is that each of the three parts is machined on a different transfer machine, each machine being of a different make. Consequently, we found a signal opportunity to study in some detail how each of the three machine tool builders solved the problem of handling the complex operational sequence.

Another point of general interest is that the manufacturing department specified chip removal on each transfer machine, and for each individual operation, to be performed at the optimum speeds and feeds for the specific aluminum alloy. As a result, surface cutting speeds vary (according to the type of tooling involved) from 120sfpm for drilling, up to a really dramatic

rate of 10,000sfpm for milling. All milling cutters are tipped with c-t-c inserts; while reamers and some other tools also are c-t-c tipped.

A soluble oil mixture is supplied under pressure and heavy flow (practically flooding), partly to cool the tools but mostly to wash away the clinging, stringy chips from the tools and work and the fixtures.

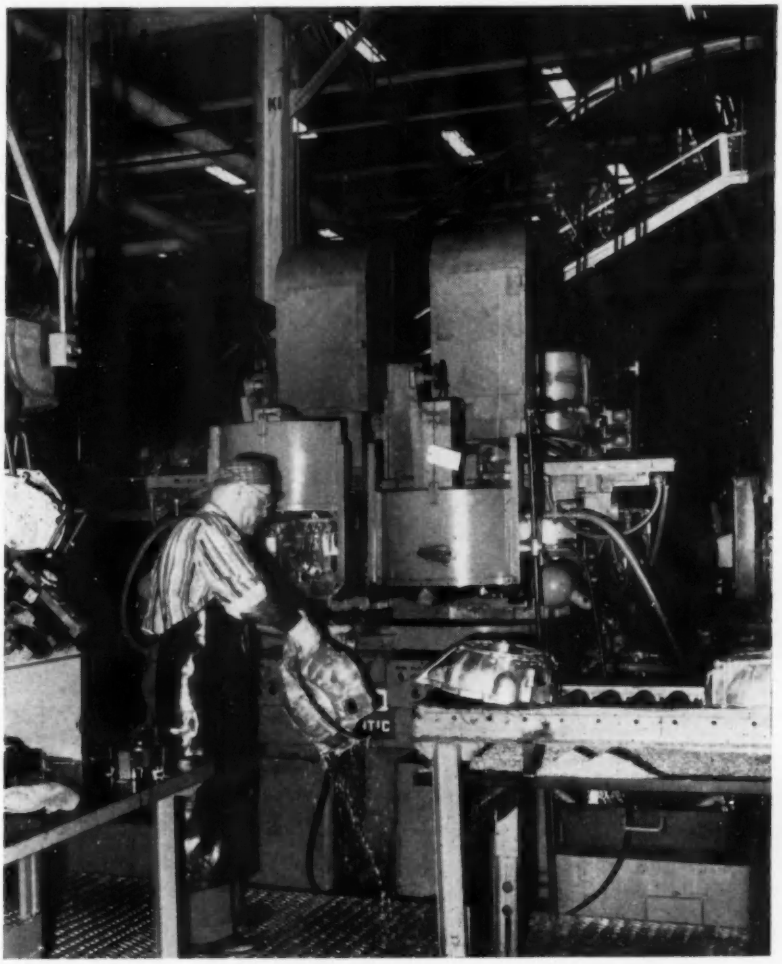
The combination of optimum cutting speeds and feeds with adequate coolant flow makes for maximum productivity and relatively-short transfer lines.

Getting into some of the details, the largest of the covers is machined in a 67-station Buhr Economatic transfer machine, with preliminary facing, turning, and boring performed in a group of two, two-spindle Heald Model 352 precision-boring machines.

A smaller cover, required in less volume, is processed over a Snyder transfer machine. Incidentally, by the use of a special adapter this machine also handles a similar cover for another application. Preliminary facing, turning, and boring of both sides of the covers is done in a two-spindle Heald Model 321 precision-boring machine.

The comment immediately above is significant because the third cover, one that appears more like an adapter, is machined complete ly within a Cross transfer machine without resort to Heald operations. Consequently, all of the turning, facing, and boring is done at stations of the Cross machine.

Now let us get to the details of each of the transfer machines:



Close-up of one of the Heald Model 352 precision-boring machines used for finishing the large covers after they have been processed in the Buhr transfer machine.

Buhr Machine

This machine has 67 stations, is about 164-ft long by 24-ft wide, and has a gross weight of 300 tons. In operation, the work is positioned and clamped automatically in a cycle that includes some 120 drilling, milling, reaming, spotfacing, chamfering, and tapping operations. Automatic probes are located at most drilling and tapping operations. In addition, certain stations are equipped with proximity switches to detect drill breakage before any damage is done.

In addition to machining, there are two automatic assembly operations: installation of a bushing at Station 31, insertion of a plug at Station 64. Air gaging is located at Station 29.

The hydraulic and electrical system is extensive. There are 29 hydraulic pumps, 148 hydraulic cylinders, 42 compensated flow valves. For power there are 66 motors, some 683 relays, 234 limit and pressure switches. The console, at the loading end of the machine, has a battery of 310 neon indicating lamps arranged in the same relative positions as the machine heads, plus 69 control buttons.

As mentioned earlier, preliminary operations on both sides of the cover are performed in Model 352 Heald Bore-Matic of two-spindle type. First operation, done with the hub face up, consists of the following steps: rough-turn large diameter and face; rough-turn hub OD and face; finish groove; rough-bore hub ID; chamfer hub.

The work then enters a second Heald and is located with hub end down to rough-face flange and pump faces; finish form; semi-finish-bore ID and chamfer. The covers now are transferred to the loading station of the Buhr machine.

Events in the Buhr machine are covered by the following sequence. Note that all idle stations have been omitted in the interest of brevity:

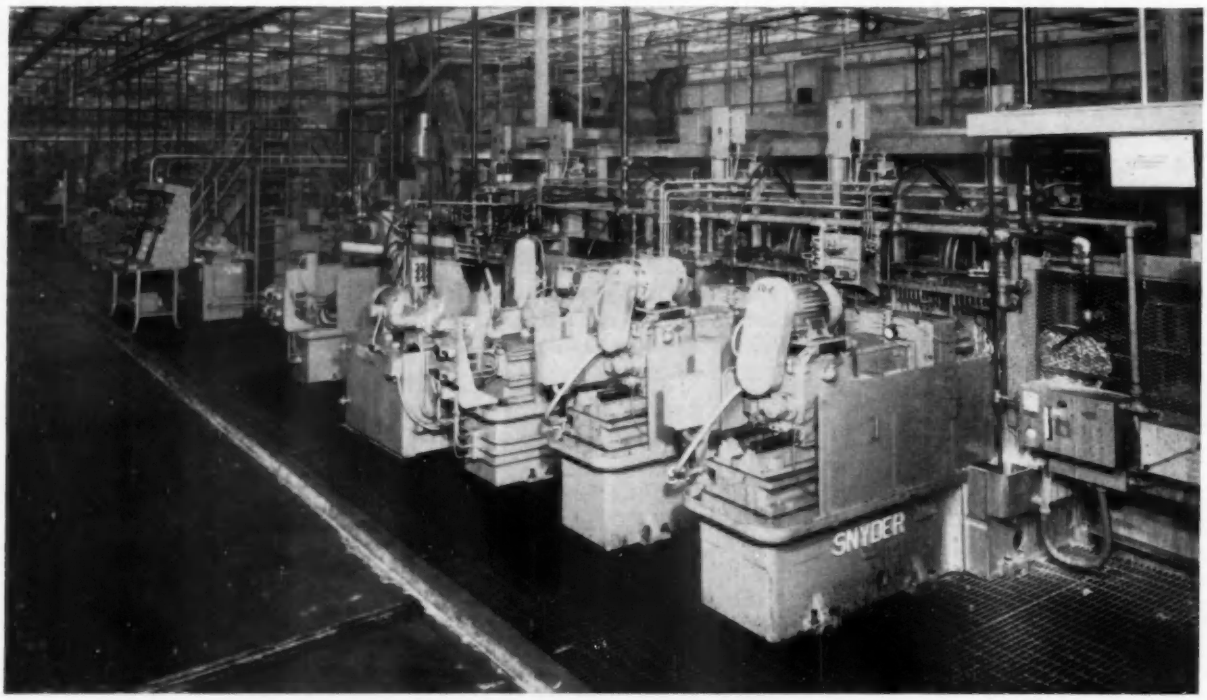
BUHR MACHINE

Station	Operation
3 RH	Mill face
LH	End-mill sides of bosses; ream two holes; drill one hole; drill and chamfer two holes
5 RH	Spot-drill three holes
LH	Ream two holes; drill four holes; end-mill sides of bosses
6 RH	Drill three holes
7 LH	Probe three holes and blow out
8 RH	Tap three holes
LH	Drill 6 holes; c'sink two holes
9 RH	Probe and blow out 3 holes
LH	Probe 4 holes
10 RH	End mill one hole
11 RH	Drill one hole
LH	Ream two holes; c'sink 4 holes
12 RH	Probe one hole
13 RH	Drill one hole
LH	Tap 4 holes
14 RH	Probe one hole
LH	Probe 4 holes
15 RH	Drill 8 holes; spotface 6 holes, c'sink one
LH	Drill one hole
16 LH	Probe one hole
17 RH	Drill three holes; ream 6 holes, c'sink two holes
19 RH	Drill and c'sink two holes
20 RH	Probe two holes
21 RH	End-mill one hole
LH	Drill one hole
22 LH	Probe one hole
23 RH	Ream two holes
25 RH	Ream two holes; c'sink two holes
LH	Rough-bore and chamfer one hole
27 LH	Finish-bore 4 holes
29 RH	Gage one hole
LH	Gage one hole
31 RH	Assembly station: press bushing
32 RH	Turn over and rotate part
33 LH	Mill face
35 LH	Drill one hole
37 LH	Drill and c'sink two holes
38 LH	Drill and c'sink one hole
40 LH	Drill two holes
41 LH	Drill one hole
43 LH	Drill two holes
44 RH Vert.	Ream one hole
LH	Drill two holes
46 LH	Drill one hole
47 LH	Drill one hole; probe 5 holes
49 LH	Tap two holes
50 RH Vert.	Tap two holes
LH	Tap one hole
52 LH	Drill one hole; probe 5 holes
RH	Rotate part
54 LH	Drill one hole
55 LH	Re-drill one hole
57 LH	Counterbore one hole
58 LH	Spotface one hole
60 LH	Tap one hole
62 LH	Probe one hole
64 LH	Press square plug
66 RH	Stake square plug

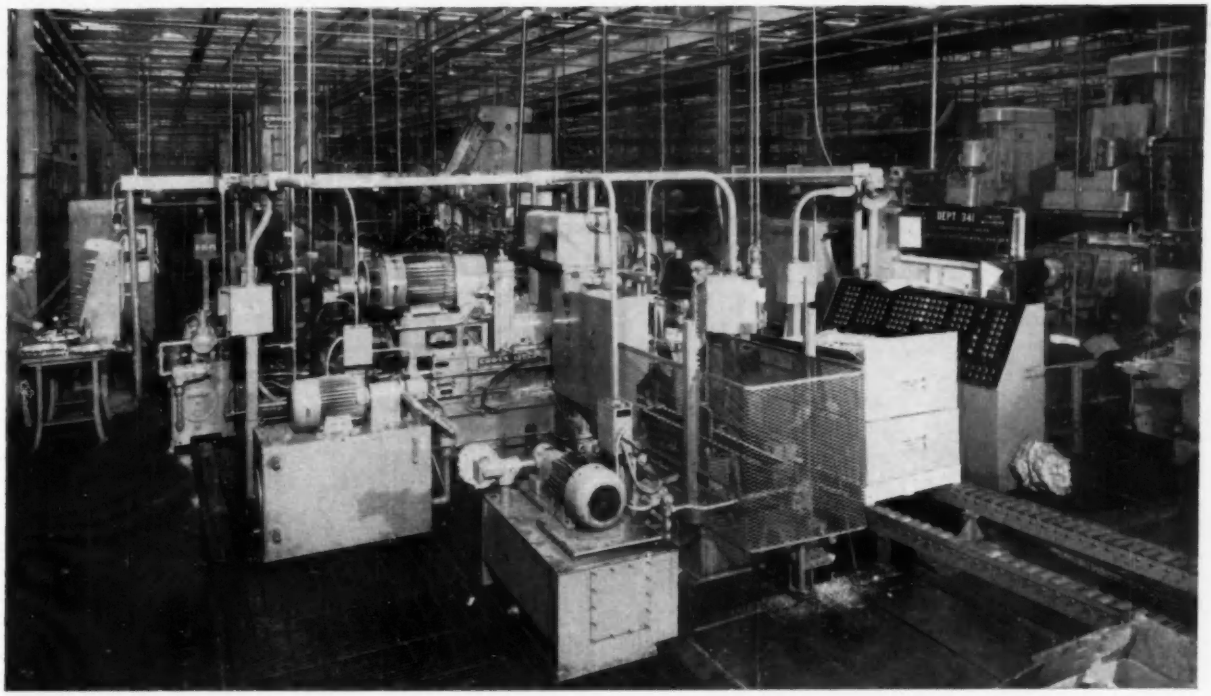
The cover leaves the machine, is transferred onto a feeder conveyer, and transported to another battery of Model 352 Heald Bore-Matics for finishing operations. Here they finish-face the flange and pump faces, finish-bore a large diameter to 6.998-7.000-in., and chamfer another face. The second Heald finishing operation is done with the hub face up. This setting includes finish-turning and facing, finish-turning of hub OD, finishing two grooves, boring the bushing ID to 1.3761-1.3751-in.

Snyder Machine

The smaller case cover is machined in the special 54-station Snyder transfer machine. Of building-block design, the machine is



Long perspective shot of the Snyder transfer machine set-up for machining covers for the Olds F-85. Part way down the line may be seen one of the many tool boards serving each of the transfer machines; also one of the cross-over bridges.



Perspective of the 73-station Cross Transfer-Matic machine with the control console in the background at right. This machine does the entire machining job from start to finish on the adapter-like cover which may be seen at the extreme right. The operator (left) is at the loading station.

114 ft long, and handles drilling, milling, tapping, spotfacing, and boring operations, together with assembly of a bushing and a stamped rectangular cup. It machines this cover for the Olds F-85, as well as a second version for another application. The machine utilizes advanced concepts of in-process gaging, probing of holes, and precision air gaging.

Random processing of two different parts that have many identical holes and surfaces, but are of different OD and configuration, is accomplished by bolting and adapter on the smaller part. This adapter provides the smaller part with a similar configuration and clamping surfaces, thus enabling it to be transferred through the machine, without changeover of any clamping details or transfer mechanism units.

The adapter is provided with lug surfaces that automatically cause certain machining stations to be inactivated where necessary.

A center hole in the cover is precision-bored, along with two other holes, at the 11th station. Then the cover is washed in Station 13. At Station 15, the center hole is air gaged for both size and surface finish. A bushing is pressed in the center hole in the 17 station, bushings being fed into pressing position by a vibrating hopper feed.

A cup-shaped rectangular stamping, precoated with a sealant, is automatically pressed into the cover and staked in position.

In all, 46 holes are machined in the processing sequence. Probing is performed after drilling and tapping to locate any undrilled holes or broken taps, triggering machine shutdown before damage occurs.

The machine is made up of 19 distinct machining segments, each one including Snyder standard building-block bases or center sections, machining units and heads. A standard walking-beam-type index mechanism moves the covers from one machining station to the next. All machining units are provided with hardened - and - ground ways and automatic lubrication systems.

In preparation for the Snyder machine, the aluminum cover is presented to a two-spindle Heald Model 321 Bore-Matic for the following operations; At one spindle—rough-face flange; rough-turn; face and chamfer large hub; rough-turn and face small hub; finish large groove on small hub; rough-bore and chamfer small hub ID. The second station rough-faces the flange; rough-turns and faces the pilot; rough-bores and faces the hub; rough-faces thrust face; finish grooves the recess.

The part then is assembled to the adapter plate and is ready for the Snyder machining cycle in the following sequence. Here, too, we have omitted idle stations:

SNYDER MACHINE

Station	Operation
2 RH	Spotface 6 holes; drill 8 holes
4 RH	Drill 8 holes
6 RH	End mill one hole
9 LH	Drill two holes
11 RH	Finish-bore center hole and two other holes
13 R & LH	Wash part
15 RH	Air gage center bore
17 RH	Press bushing part way
19 RH LH	Turn part and rotate Orient
21 RH	Mill pad
24 RH	Drill two holes

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QUALITY CONTROL
in Friction Material Manufacturing

By

R. L. Cleveland,
Chief Industrial Engineer
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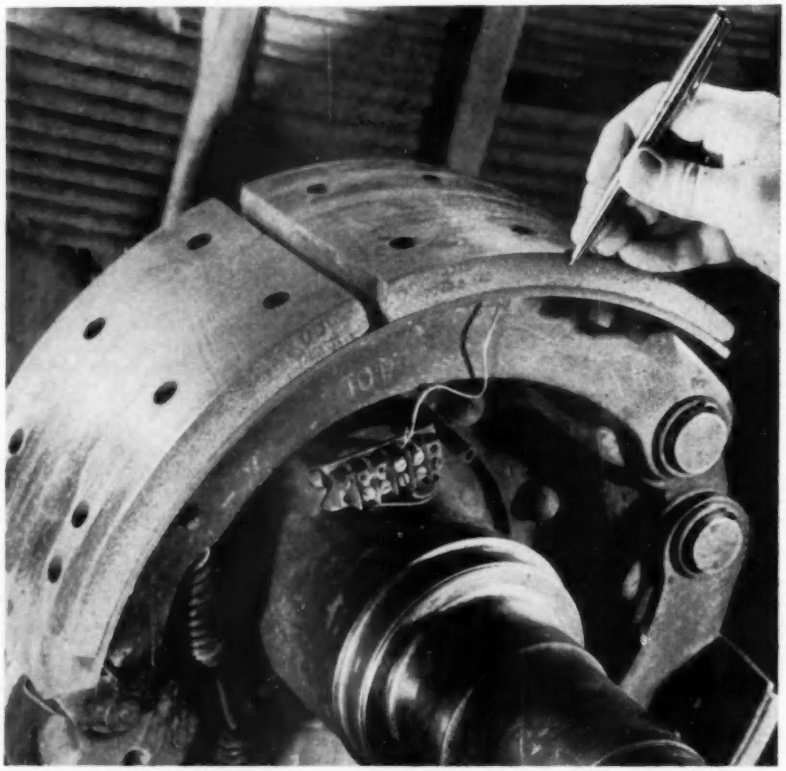
RAYBESTOS-MANHATTAN, INC.

and

K. A. Gainer,
Mgr., Quality Control Div. & Inspection
U. S. Asbestos Div.
RAYBESTOS-MANHATTAN, INC.



Thermocouples imbedded in brake blocks indicate lining temperatures. Readings are taken during vehicle test schedule designed to check actual temperatures under operating conditions. Heat level is recorded on vehicle dash instrumentation.

THE increasing use of superhighways and expressways, with their much-higher average operating speeds, emphasizes the importance of high-quality brake systems on automobiles. Of prime consideration in the manufacturing of friction materials, which will be incorporated in these systems, is quality control.

Raybestos-Manhattan, Inc., with manufacturing facilities throughout the United States and abroad, has initiated precise controls and extensive customer collaboration to produce the high-quality friction materials required in today's varied high-temperature applications. R/M serves the automotive industries through a staff of more than 300 technicians and engineers in laboratories which are equipped to test all types of friction materials. This company has spent 58 years engineering friction materials to satisfy complex automotive requirements.

Heat absorbing capacity of brake linings and drums has suffered in the battle for weight reduction because of smaller wheels and reduced friction surfaces available for heat dissipation. Horsepower has tripled since 1938, producing higher speeds and accompanying higher temperatures in the drums.

Brake friction materials manufacturers have made significant improvements to stay abreast of automotive advances. Maintaining a satisfactory product to meet constantly altered conditions means selection, design, and fabrication of friction parts on a custom basis for each new braking or power transmission application. Friction materials are usually sold on a sample basis to the original equipment manufacturers. The manufacturers test the materials which have been submitted for their particular application.

Some factors considered in selecting and testing a sample are the driving conditions under which

the part will function, geographical conditions likely to be encountered, metallurgy of mating surfaces, driver habits, and methods of installations.

As friction materials are selected by "cut and try" methods, an integral part of customer-supplier collaboration is quality control that assures the performance needed for any given application. Customers, in seeking reliability of performance, look to the friction material supplier for quality control procedures and techniques that assure expected product performance.

Pattern of Customer Collaboration

For years R/M engineers have used what they refer to as value engineering, determining whether each product provides the most performance at the least possible cost. Value engineering requires the supplier to discover exactly how the customer uses the product desired, then to guide the customer in his specifications to get optimum performance per dollar of cost. This information is then disseminated through the sales, manufacturing, and laboratory staffs, which correlate these facts with their respective functions and responsibilities.

The customer, relying on the manufacturer to provide a constant supply of material exactly the same as the sample, counts on two things: 1. Dimensional quality control, or dimensional consistency. 2. Performance quality control, or repeated reliable performance.

Once a sample is approved, each subsequent shipment must have identical characteristics—physical and functional. The customer expects material received to perform exactly as his sample did. Indeed, he requires such identical repetition of material that even the color, appearance and "feel" of the production item must conform to the sample.

Some resins, when subjected to high temperatures during processing, will not always produce a consistent color although the processing sequence is identical. The degree of grinding also influences the color of friction material surfaces. Heavy grinding of material containing asbestos gives a light asbestos color. Light grinding produces a dark color because only the darker resins show.

To gain needed control in producing identical friction parts of high quality, a program of process preventive maintenance must be effected. The key to successful quality work is to inspect and examine raw material prior to processing and then to check the work as it is made instead of inspecting for dimensional accuracy after parts have been made. At R/M this is done by quality analysts and checkers who continually patrol the manufacturing operation. The status of the operation is recorded on a control chart or a check sheet which is posted at the station which is under surveillance. This is the means of showing immediately if anything is amiss or "out-of-control" so that immediate corrective action is taken.

The Control Chart for Variables

This is a piece of graph paper on which plotted points act as a guide in analyzing manufacturing operations. On both sides of the centerline (or zero mark) is found a parallel horizontal line called the upper control limit (UCL) or the lower control limit (LCL). Each chart is properly scaled to represent that particular item under observation.

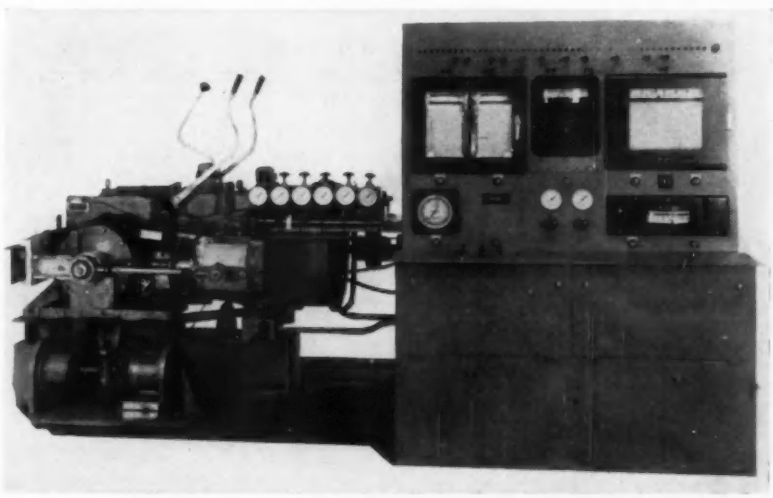
Small groups of readings (4 or 5) for a particular dimension are taken from the process at varying intervals as the work progresses. The average of the dimensions in each group is plotted on the chart. Each plotted average is connected by a line to graphically show the trend of operations.

The range is also plotted on the same chart as the lower section. Range is the difference between the greatest and smallest dimension in each group of parts sampled and is a measure of dispersion of the process.

When analyzed in conjunction with the averages, this provides a clear picture of the operation for the quality analyst, supervision, and production operator.

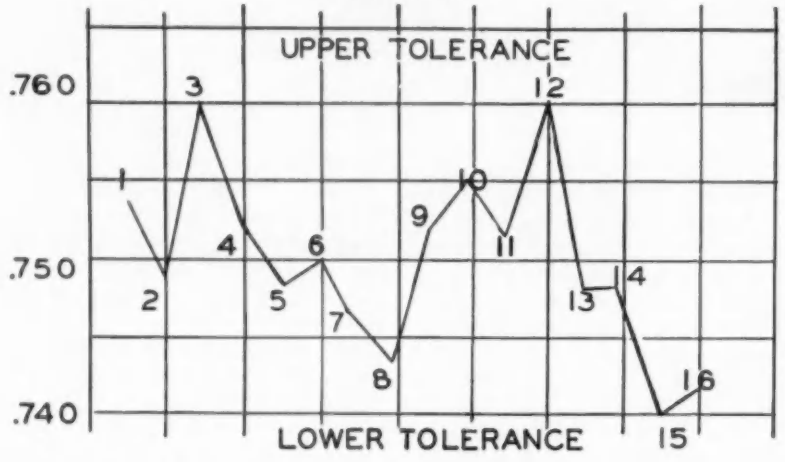
It must be understood that the statistical control chart for variables is not a conventional chart with limit lines of actual tolerances. For example, if customer's specifications demand a brake block that is 0.750 in. thick $\pm$0.010 in., a conventional chart would look like chart A on the following page.

This conventional chart has se-



Laboratory mock-up of customer earthmoving unit using actual mechanical parts, and drive mechanisms. Instrumentation at right, attached to complete operating unit at left, enables R/M to determine optimum friction members for specific customer operating conditions and field applications.

CHART A



PIECE NUMBER	THICKNESS	PIECE NUMBER	THICKNESS
1	.754	9	.752
2	.749	10	.755
3	.760	11	.752
4	.752	12	.760
5	.748	13	.748
6	.750	14	.748
7	.747	15	.740
8	.743	16	.741

vere limitations on its usefulness as it demands that the dimension for each piece in the lot be plotted after gauging. This, in effect, is 100 per cent inspection—a costly proposition.

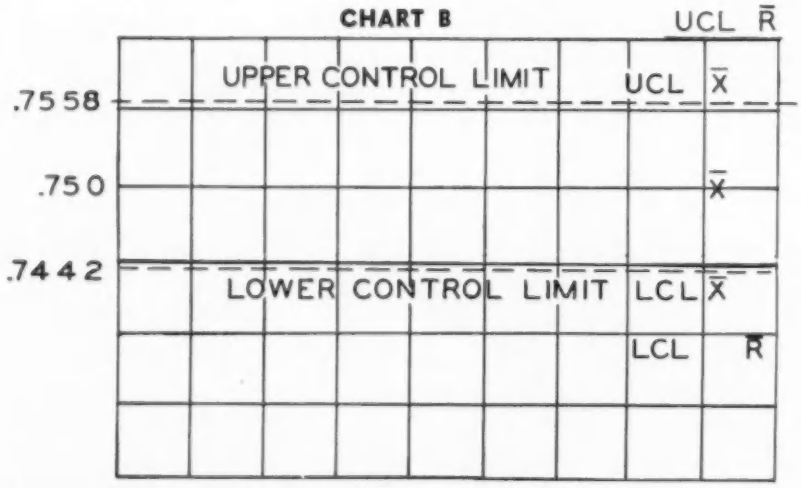
On the other hand, the control charts which are statistically established, show the plottings of small samples. Dimensional checks are made periodically and at random. Mathematically it is possible to establish upper and lower control limits. Using the same customer tolerance limits in the conventional chart above the statistical control chart will have these limits, and look like chart B, below.

Notice that the statistical tolerances are now 0.7558 and 0.7442 against 0.760 and 0.740. This was devised by the following formulae: X (pronounced X bar) is the arithmetical mean 0.750. R (pronounced R bar) is the average of the ranges—in this case 0.008 in. (not shown).

A_2 and D_4 are mathematical constants based on the laws of probability (in this case for a sample of four) and must be accepted on faith.

We see that with the use of statistical limits, based on a definite sample size with a random cause system in operation, periodic sampling of parts at planned intervals is sufficient to determine a process distribution. As a matter of fact, when plotted points (for averages of samples) fall within the limits, chances are that 99.73 per cent of the pieces produced over a long run are passable.

CHART B



$UCL_{\bar{x}} = \bar{X} + A_2\bar{R}$
$= .750 + (.73 \times .008)$
$= .7558$

$LCL_{\bar{x}} = \bar{X} - A_2\bar{R}$
$= .750 - (.73 \times .008)$
$= .7442$

$UCL_R = D_4\bar{R}$
$= 2.28 \times .008$
$= .01824$

The Check Sheet

Certain jobs which do not lend themselves to a control chart application are under surveillance through the use of a check sheet. This is a ruled sheet of paper with appropriate headings for the particular item. It is used for attributes inspection i.e. good or bad. Its advantage is that it provides a written record of the condition of the work during the process, number of times the inspection was made and the person doing the inspection. Of course when a "no-go" proposition is exposed, immediate corrective action is taken. Periodically during the day, the production foreman, operator and quality analyst measure, examine and record their findings to insure that only work of the highest grade is being produced.

An outstanding feature in the use of the charts and sheets is the genuine interest it has created on the part of the operators to stay "within control." Employees normally desire to do a good job but invariably are denied a tangible means of seeing—and understanding—the efforts of their labor. The charts are the personal records which provides the explanation and recognition that goes so far in inducing better workmanship.

Manhattan employees are determined that its customers shall receive only the best in services and products. Customer satisfaction is

(*Turn to page 78, please*)

. . . . . Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

By Kenneth Rose
MID-WEST EDITOR

THE construction equipment manufacturing industry has closed a year in which dollar volume of sales fell below the 1959 level by about 5 to 15 per cent. Officials of leading companies in the industry find a number of hopeful signs for the coming year, even though there are many uncertainties still clouding the picture. Some of the indicators are:

Dollar value of new construction contracts awarded or offered for bid in December will exceed the value of such contracts for any December for the past three or four years. This indicates a high level of construction activity for 1961.

Stocks of new equipment in the hands of distributors are low. In some cases they may be at a record low. Manufacturers have been cooperating with distributors in liquidating of inventories so as to put the distributors in the best financial position possible. Countering this are the facts that manufacturers' inventories are rather high in most cases, and that distributors are holding what is probably a record stock of used equipment, taken in trade or repossessed.

The cycle of "buy or repair" is due to swing to "buy" during 1961, if past performance in this market is a guide. Both distributors and manufacturers have reported an unusually high level of parts sales, indicating that contractors are repairing present equipment rather than making purchases of new machines. In the past, as at present, this has coincided with low sales of machinery. This has always been followed by a period of good sales of construction equipment and low sales of parts as contractors replace rundown and no longer efficient machines. Again, a countering factor appears in that there is a large amount of used equipment on the market—used equipment taken in, in trade by distributors, equipment sold or to be sold at auctions, surplus government-owned equipment, and rental or leased equipment now being offered for sale.

Summing up all of these factors, officials of leading companies in construction industry manufacturing state that they expect 1961 to show definite improvement over 1960 in volume of business. Most of the improvement will come during the second half of the year, they estimate, when contracts now being let will have progressed to the point of moving earth.

New Crawler Tractor by Case

A new crawler tractor by J. I. Case Co., just announced, will be introduced at the Hawaiian World Premiere and displayed by dealers during January and February. Designated the 750 Crawler by Case, it has ample power, maneuverability, and ease of operation as its features.

The 750 Crawler has a 301 cu in. Diesel engine, Case built; a Terromatic transmission, and a load-sensing torque converter that produces up to 23,000 lb push-pull effort. Power shifting, power steering, finger-tip hydraulic controls, and independent power control of each track are additional operating features.

Ease of maintenance is given special attention in the design. Lower track rollers are self-lubricating; oil and fuel filters are easily accessible, and the electrical system can be reached without difficulty. The new hydraulic track adjustment was designed for faster, easier daily maintenance.

Two New Crawlers by Allis-Chalmers

Two new Allis-Chalmers crawlers, the H-3 using gasoline, the HD-3 a diesel model, have been announced for the construction and industrial fields. Both have 4-cylin-

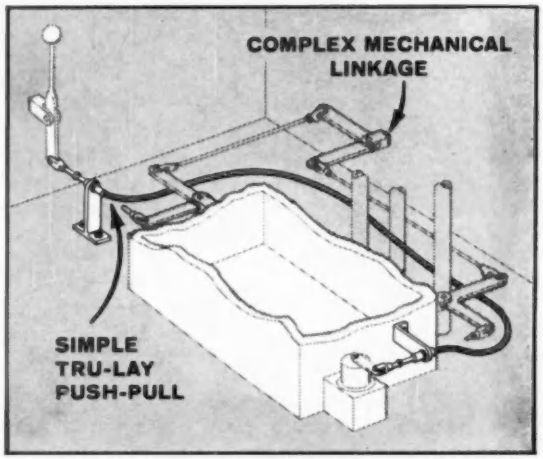
(*Turn to page* 102, *please*)

The Case 750 crawler tractor

ACCURATE REMOTE CONTROL FOR HUNDREDS OF PRODUCTS

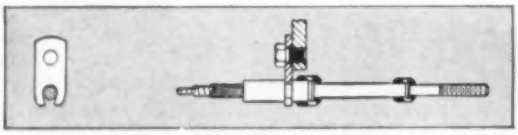
— — with Tru-Lay *PUSH*-PULL Controls

If your products involve remote control—electrical, hydraulic, pneumatic or direct—TRU-LAY PUSH-PULL FLEXIBLE CONTROLS can help solve your design problems. They provide positive remote control over short or long distances—up to 150 feet from the control point. Because they operate while flexing, they can snake around obstructions. They will not buckle. They are ruggedly constructed, easily installed and operated, sealed against dirt and moisture, and will handle jobs with as much as 1,000 lbs. input. PUSH-PULL CONTROLS are simple, have but one moving part, are noiseless and give a lifetime of accuracy. Mechanical linkages, on the other hand, are complex. Unlike PUSH-PULL CONTROLS, they are made of many parts, wear at many points, and produce increased backlash, vibration rattles and lost accuracy.

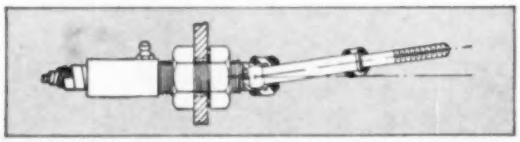


THESE FEATURES HELP SOLVE DESIGN PROBLEMS

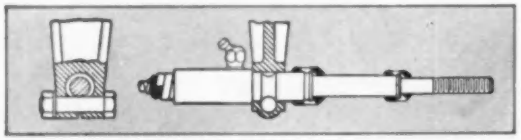
Anchorages



Clip anchorage • a simple clip for light loads

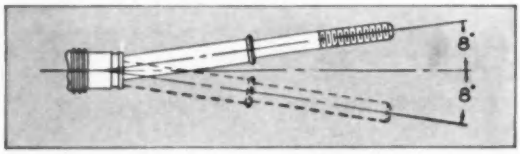


Bulkhead anchorage • for heavy-duty installations



Machined bracket anchorage • can be furnished for mounting any PUSH-PULL cable at the swivel terminal

Swivel Action



Standard assemblies have end fittings with a swivel movement of ± 8° to compensate for misalignment and rise or fall of lever arms. Swivel joints, and the sliding ends, are sealed against dirt and moisture.

PUSH-PULL DATA FILE SHOWS HOW TO SIMPLIFY, IMPROVE DESIGN

• Write for your PUSH-PULL Data File. It contains a complete set of engineering bulletins which describe in detail the operation of PUSH-PULL CONTROLS, their applications, features and advantages.

ACCO

PUSH-PULL CONTROLS

Automotive and Aircraft Division • American Chain & Cable Company, Inc.

601-H Stephenson Bldg., Detroit 2

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Circle 138 on Inquiry Card for more data

MIDLAND

MIDLAND VACUUM POWER BRAKE SETS NEW ENGINEERING STANDARDS

AUTOMOTIVE ENGINEERS CITE THESE FEATURES . . .

VACUUM SUSPENDED—power is continuously and instantly available for every application.

NO EXTERNAL RESERVOIR NEEDED—no additional plumbing and fittings required to accomplish ample engine-off safety.

POWER WITH ENGINE OFF—the vacuum suspended principle results in a series of power stops available in case of engine stall.

MASTER CYLINDER NOT SUBJECTED TO VACUUM—at no time (either applied or released) is master cylinder subjected to manifold vacuum.

HYDRAULIC SYSTEM REMAINS INTACT—the unit does not require additional hydraulic connections.

SIMPLE INSTALLATION—unit mounts on same bolts as provided for master cylinder in standard brake vehicle.

LOW PEDAL PROVISIONS—ample power available to warrant low pedal geometry and direct connection retains pedal "feel".

PROTECTED VALVING—the entire valve and force dividing means is internal, protected from damage.

SAFETY EVEN ON FAILURE—failure of the booster or complete loss of vacuum in the system will not impair full use of physical pedal effort on the master cylinder.

For further information write: Midland-Ross Corporation, Owosso, Michigan.

MFR

POWER MIDLAND BRAKES

Circle 139 on Inquiry Card for more data

QUALITY CONTROL

in Friction Material Manufacturing

(*Continued from page 74*)

paramount and all effort is directed toward this goal. The use of high grade material, skilled workmanship and the use of the charts, check sheets, checkers and inspectors are all a means to this end.

Equipment studies reflect the extent to which a properly adjusted machine will, without error, produce pieces to specification. Materials studies tell whether a material is susceptible to dimensional changes during processing.

R/M, adhering to a comprehensive preventive maintenance policy, predicts wear on tools, machines and instruments, anticipates known or suspected difficulties before they occur, and evaluates machinery and material with regard to customer specifications in both production and prototype models. Frequent tests on production parts insure that standards are maintained.

Service engineering is important at R/M, and customer equipment and test procedures are duplicated in laboratory and production facilities. As procurement and manufacturing problems cannot be solved by specifications alone, maximum customer satisfaction requires friction materials manufacturers to have a thorough knowledge of end product use and what effects variations in frictions parts will have on customer products. Evaluation differences appear when identical techniques but different instrumentation and mechanical parts are used. Extensive collaboration in duplicating customer's assemblies and test facilities to determine optimum friction members for specific applications helps the user secure material engineered to exact specifications.

The Physical Test Section machine-tests friction materials, equating laboratory conditions with over-the-road service conditions. R/M and competitive products are tested against customer specifications. Products passing rigid tests are placed in vehicles for road testing. This section also checks incoming raw materials before acceptance for production use.

Research and development evaluates new materials and products, and collaborates with customers in engineering materials for specific applications. The section analyzes competitive products, serves as a trouble-shooter on friction applications, and operates a complete pilot plant which simulates all eight friction material production processes in the plant.

When a customer has approved samples, this section prepares plant manufacturing specifications, which are later issued to operating departments and to quality control. After specifications become a part of manufacturing operations, quality control maintains production specifications through raw materials receipt, in-process operations, and final inspection.

An important part of this section is the Physical Constants Department, which determines such various physical properties of products as shear strength, impact, elongation and other material characteristics. A complete chemical laboratory for analyzing production, sample and competitive parts is another part of this section.

The Brake Service Section evaluates products in over-the-road tests. The Raybestos Div., the principal OEM brake materials div., has some 23 vehicles—19 cars and 4 trucks, and is one of the largest friction materials test fleets in the country. Vehicles are fully equipped with test instrumentation.

Field Evaluation Facilities

The company conducts road tests on varied terrain in Connecticut, mountainous Jennerstown, Pennsylvania, and in Arizona. Jennerstown is used by most major axle, truck and passenger car manufacturers, and suppliers for testing brakes. Automotive suppliers maintain test garages and staffs here. Materials proved in laboratory simulated-use tests are placed on vehicles at Jennerstown and tested over a variety of terrains. Specified routes are used to standardize comparison. The Pennsylvania terrain is rugged and ideal for durability and brake fade tests. In the Arizona test area, materials are tested at high-speeds and high temperatures.

Advance Specification Planning

New models under test by automotive companies, but not yet on the market, are studied by obtaining complete assemblies, such as brake units, and testing R/M materials in these assemblies. Future automotive friction needs are anticipated by buying current model cars and equipping them with R/M products, if they are not already so equipped. Field tests are designed to produce recommendations for improvement or modification.

Evaluation of Production Units

Every two weeks, production linings are subjected to laboratory dynamometer tests which impose under controlled conditions loads that parts will experience in actual service. Tests performed are:

1—**Torque output and deceleration (speeds and brake input)**

2—**Evaluation of lining life (wear test)**

3—**Brake characteristics (fade and recovery tests, noise, chatter, grabbiness)**

4—**Drum evaluation (wear, heat checking, drum scoring)**

Each month production brake linings are placed in test cars and subjected to a vehicle performance evaluation which takes 10 days. Total expense for the period, including driver's salaries, time, parts, labor and maintenance, based upon an average run of 200 miles per day at a rate of approximately 1 dollar a mile, runs about $2000.00. In a given month, R/M test car operations result in a prodigious monthly test expense. ■

Circle 140 on Inquiry Card for more data ⟶

A SHORT STORY ABOUT SPRINGS

A **BURTON** coil spring

or a **BURTON** leaf spring

brings continued smiles from drivers

and fewer bills for maintenance

ask White, Mack, Diamond T, Dodge, Studebaker, Reo or Fruehauf

...or ask us...we've been engineering top quality springs since 1923

BURTON Auto Spring Corporation

WESTERN AVENUE AT 48TH STREET • CHICAGO 32, ILLINOIS

INDUSTRY STATISTICS

By Marcus Ainsworth, STATISTICAL EDITOR

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Vehicle Make	Weeks Ending Dec. 31	Weeks Ending Dec. 24	Year to Date 1960	Year to Date 1959
PASSENGER CAR PRODUCTION				
Total—American Motors	6,573	9,074	485,745	401,446
Chrysler	1,582	1,531	87,420	69,411
De Soto	.....	.....	19,411	41,423
Dodge	375	3,606	362,804	192,798
Imperial	.....	324	16,829	20,963
Lancer	4	545	48,810	.....
Plymouth	24	4,542	252,454	393,213
Valiant	80	3,175	231,510	19,991
Total—Chrysler Corp.	2,065	13,723	1,019,236	737,799
Comet	1,903	2,101	198,031	29,677*
Falcon	7,719	7,936	505,428	100,757
Ford	17,124	17,279	1,004,305	1,427,835
Lincoln	743	955	29,683	30,375
Mercury	1,905	2,198	161,787	156,765
Total—Ford Motor Co.	29,396	30,469	1,899,234	1,745,409
Buick	3,838	4,822	271,071	232,579
Buick Special	1,295	1,526	38,733	.....
Cadillac	2,339	3,201	158,941	138,527
Chevrolet	22,296	27,260	1,614,341	1,349,562
Corvair	4,981	5,828	259,276	79,418
Oldsmobile	4,785	5,995	362,681	366,305
Oldsmobile F-85	1,064	2,158	39,931	.....
Pontiac	5,323	6,843	418,154	388,856
Tempest	1,509	3,065	32,052	.....
Total—General Motors Corp.	47,430	60,718	3,193,180	2,555,247
Total—Studebaker-Packard Corp.	997	997	105,902	153,823
Checker Motors	76	116	6,980	5,768
Total—Passenger Cars	86,537	115,067	6,701,279	5,599,492
TRUCK AND BUS PRODUCTION				
Chevrolet	5,483	6,452	394,017	326,102
G. M. C.	1,114	1,111	100,521	75,411
Diamond T	25	22	2,471	5,359
Divco	24	41	3,573	3,796
Dodge and Fargo	342	1,101	70,305	71,680
Ford	6,249	6,292	339,239	331,348
F. W. D.	14	11	881	1,067
International	1,498	1,843	119,627	143,231
Mack	.....	196	14,529	17,027
Studebaker	.....	72	12,314	10,779
White	262	286	15,895	19,976
Willys	.....	1,723	121,856	111,647
Other Trucks	75	75	4,340	3,981
Total—Trucks	15,086	19,225	1,199,568	1,121,404
Buses	60	75	4,155	2,692
Total—Motor Vehicles	101,683	134,367	7,905,002	6,723,588

1960 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	October	Ten Months 1960	Ten Months 1959
Vans			
Insulated and refrigerated	327	4,724	4,760
Steel	34	641	470
Aluminum	293	4,083	4,290
Furniture	51	1,741	1,315
Steel	45	1,515	1,080
Aluminum	6	226	235
All other closed-top	1,716	22,391	23,997
Steel	678	5,622	6,474
Aluminum	1,038	16,769	17,523
Open-top	155	2,367	2,591
Steel	53	674	1,092
Aluminum	102	1,693	1,499
Total—Vans	2,249	31,223	32,863
Tanks			
Non- and low-pressure			
Petroleum and aircraft refuelers			
Carbon and alloy steel	153	1,324	1,919
Stainless steel	12	209	259
Aluminum	107	1,487	1,473
Total—Petroleum	272	3,020	3,651
Chemical, food, and sanitary	52	839	452
Dry materials	18	984	1,303
High-pressure (LPG, chemicals, etc.)	33	298	301
Total—Tanks	375	4,941	5,707
Pole, pipe, and logging			
Single axle	24	194	330
Tandem axle	45	695	1,003
Total	69	889	1,333
Platforms			
Racks, livestock, and stake	82	412	467
Grain bodies	79	1,010	1,433
Flats, all types	476	7,433	8,485
Total—Platforms	637	8,855	10,385
Low-bed heavy haulers	183	1,798	2,142
Dump trailers	88	1,299	2,064
All other trailers	210	2,962	2,469
Total—Complete Trailers	3,811	51,967	56,763
Dump trailer chassis[1]	61	715	.....
Trailer chassis only[1]	121	2,544	3,267
Total—Trailers and Chassis	3,993	55,226	60,030
Detachable van bodies[1]	.....	2,570	3,430

[1] Sold separately.

NEW PASSENGER CAR REGISTRATIONS BY REGIONS*

Zone	Region	October 1960	September 1960	October 1959	Ten Months 1960	Ten Months 1959	Per Cent Change Oct. over September	Oct. over Oct. 1959	Ten Months 1960 over 1959
1	New England	34,275	27,750	30,000	320,304	275,509	+23.51	+13.95	+16.26
2	Middle Atlantic	105,151	86,694	98,504	1,078,652	917,757	+21.29	+ 6.75	+17.53
3	South Atlantic	73,254	63,033	67,922	730,279	680,242	+16.22	+ 7.85	+ 7.36
4	East North Central	132,675	108,025	131,743	1,369,486	1,314,528	+22.82	+ .71	+ 4.18
5	East South Central	25,641	17,582	24,457	247,773	230,966	+45.84	+ 4.84	+ 7.27
6	West North Central	47,010	37,639	47,739	459,133	465,418	+24.90	- 1.53	- 1.35
7	West South Central	42,543	38,105	47,803	441,990	460,407	+11.65	-11.00	- 4.00
8	Mountain	19,694	17,788	20,396	192,182	191,000	+10.72	- 3.45	+ .62
9	Pacific	67,218	62,149	66,201	649,541	645,249	+ 8.16	+ 1.54	+ .67
	Total—United States	547,461	458,765	534,847	5,489,330	5,181,096	+19.33	+ 2.36	+ 5.95

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Alas., Cal., H. I., Ore., Wash.

* Compiled from official state records. Data property of R. L. Polk & Co. May not be copied, sold or reprinted without Polk permission.

1960 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

Period	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	Over 33,000 lb.	Total
First Quarter	203,679	56,758	3,747	9,305	53,754	20,834	10,805	10,037	368,919
Second Quarter	189,711	51,817	3,052	9,931	48,018	20,534	10,687	10,283	344,033
Third Quarter	112,996	33,796	2,502	8,291	36,135	14,830	7,137	6,743	222,430
Total—Nine Months	506,386	142,371	9,301	27,527	137,907	56,198	28,629	27,063	935,382
October	42,534	12,091	1,101	1,670	10,011	3,717	1,929	1,981	75,034
Total—Ten Months—1960	548,920	154,462	10,402	29,197	147,918	59,915	30,558	29,044	1,010,416
Total—Ten Months—1959	508,453	156,024	12,407	63,355	123,106	55,035	36,244	33,597	1,008,221

NEW PRODUCTION and PLANT EQUIPMENT

By C. J. Kelly
ASSISTANT EDITOR

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Variable Speed Drive

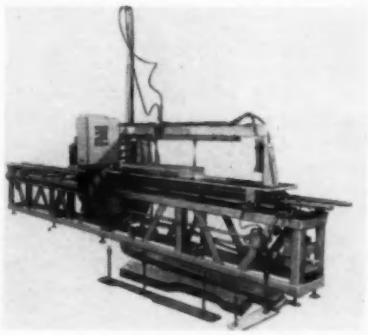
AN infinitely variable range of speeds are available with a new unit. With the incorporation of an

1800 rpm motor speeds can be obtained from 180 to 1800 rpm. Using a 1200 rpm motor, speeds are in the 120 to 1200 rpm range. Either drip-proof or totally enclosed types are available, in ½, ¾ or 1 hp. A control wheel regulates the output shaft to the desired speed. A pointer indicates on a calibrated speed plate, the exact rpm at which the output shaft is turning. *The Lima Electric Motor Co.*

Circle 47 on Inquiry Card for more data

Contour Router

DESIGNED to follow contours automatically, a new double head contour router will cut both sides of the work at once. The fully automatic machine will operate pneumatically or hydraulically, and has a completely adjustable spread that will adjust to any variation in the template. This unit, according to the manufcaturer, was built at the behest of the automobile industry to aid in solving the problem of machine planning aluminum trim for the 1961 models. This unit is said to increase the processing of aluminum trim by

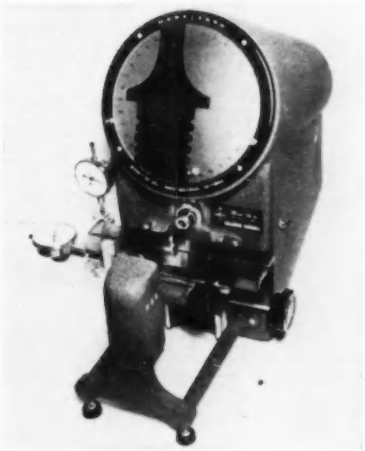


many hundred percent. *The Crossley Machine Co.*

Circle 48 on Inquiry Card for more data

Optical Comparator

AN optical comparator has been designed to carry inspection operations to the various points of manufacture. Named the Micro Vu 300, this portable unit provides 20 power magnification for precise visual



inspection of components ranging from microminiature parts to 3 in. A. N. fittings, contours of cutting tools and small assemblies. Requiring less than three sq ft of bench area, the device weighs around 20 lb and has an 8 in. screen. *Micro Vu.*

Circle 50 on Inquiry Card for more data

Automatic Turret Drill for Production Operations

An automatic, six spindle bench model turret drill provides automatic power feed and turret indexing. The machine sets the pace, rather than the operator, increasing production of operations requiring precision drilling, reaming, tapping, etc. Controlled infinitely variable power feeding with pre-selective individual spindle speeds that automatically shift insure optimum machining efficiency, finest finish, and longest tool life. Individual depth stops are provided for each spindle to permit rapid traverse to the work and limit depth of cut. Burgmaster Corp.

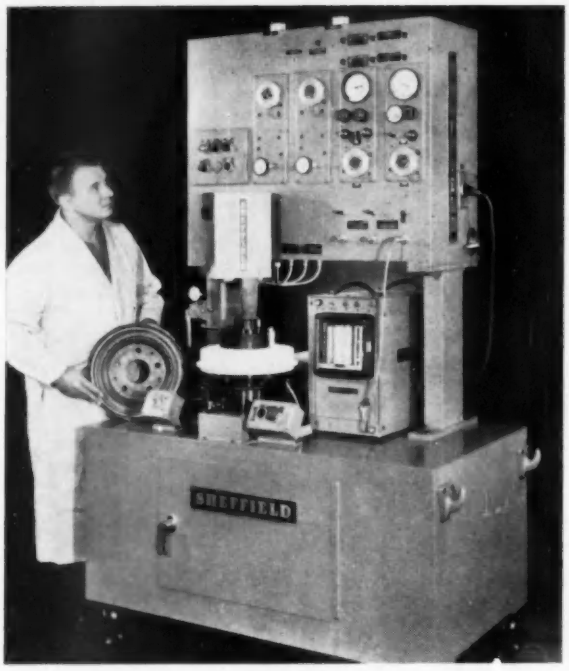
Circle 49 on Inquiry Card for more data

Gage Checks Brake Drums Automatically

DESIGNED to be used in an automobile manufacturer's receiving inspection, this gage automatically checks the inside diameter of a brake drum at two places on the braking surface as well as out-of-round and eccentricity. Colored signal lights indicate acceptable or reject dimensions. The gage also makes a functional check of the size, depth, and runout of the dust grooves on the exterior of the drum.

The gage will use a *Sheffield* Pneumatic Strip-Chart Recorder, as shown, to provide a printed record of dimensional quality simultaneously with the automatic gaging operation. Any one of the diameter checks or the amount of eccentricity can be recorded with the single-pen instrument. The addition of a two-pen recorder will permit all three points of inspection—two diameters and eccentricity—to be recorded simultaneously, if desired.

Interchangeable air gage tooling accommodates 9, 10, and 11 inch size drums. Inspection rate is up to 250 parts per hour. *The Sheffield Corp.*



The automobile brake drum being gaged here was painted white for clarity. This gage is mounted on four oversize casters so that it can be easily moved. Ample space is provided in the cabinet-type base to store the interchangeable gaging elements. The overall dimensions of the unit are 30 in. wide by 4 ft long.

Circle 51 on Inquiry Card for more data

Tape Controlled Machine Automates Job Lot Production

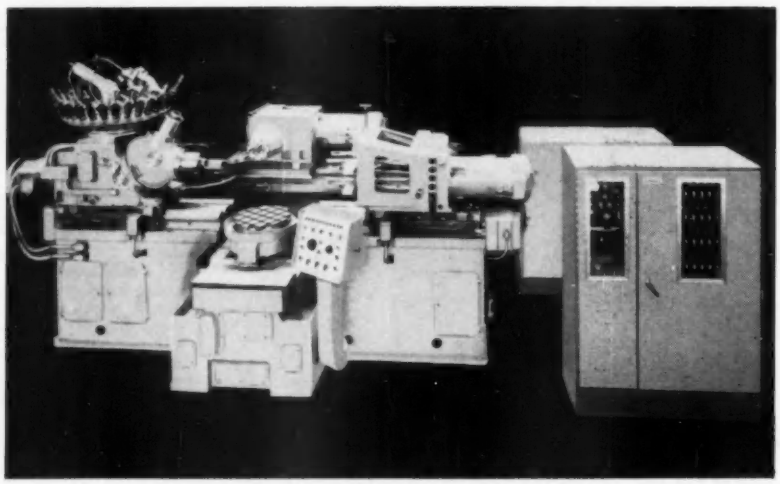
AN automated machine tool has been developed to bring production line efficiency to batch lot production of parts requiring face and other milling cuts plus drilling, boring, reaming and tapping.

Known as the MT-3 Machining Center, this machine is reported to be very versatile and capable of performing machining operations on a large variety of parts in sizes up to that containable within a 12 in. cube.

Designed on the building block principle, the new MT-3 has a central positioning table surrounded by three tape controlled work heads: (1) a universal drilling, tapping and boring head with a storage capacity for thiry tools which changes tools in less than three seconds; (2) a face milling head; (3) and optionally, a multiple spindle drill head or a precision boring head with a 14 tool capacity changer. The MT-3 may be purchased without the third head if individual manufacturing requirements do not require it.

An electronic numerical control system directs the operation of the unit. Work is positioned in relation to cutters in increments of 0.001 in. to an accuracy of ±0.0005 in., the manufacturer reports. The transportation of engineering information from drawing to control tape is accomplished on an inexpensive tape preparation unit. No computer is required. Manufacturing lot quantities ranging from five to five hundred parts are particularly well suited to production with the MT-3. *Hughes Aircraft Corp.*

Circle 52 on Inquiry Card for more data



This three station machine has independent spindle drive motors, each with 5 to 7½ hp capacity.

NEW PRODUCTION and PLANT EQUIPMENT

Motorized Assembly for Special Milling Machine

This precision milling spindle and slide assembly identifies the coordinated Design-Engineering effort of the spindle manufacturer and the original equipment manufacturer for whom this assembly was produced.

THE Spindle performs the major cutting operation on a special milling machine for milling the curvature in steel mill rolls, while the rolls remain mounted in their respective housings, without dismantling.

The rolls are driven and the machining operation is accomplished in one rotation of the roll.

Depths of cut vary from a light finish cut to a maximum of approximately 0.125 in. The rolls are milled in pairs. The horizontal adjustment, parallel to the spindle centerline, sets the cutter for various roll diameters. The milling cutter diameters are equivalent to the radii of the various roll grooves.

This 20 hp motorized assembly has seven speed changes from a minimum of 70 to a maximum of 450 rpm. Speed change is accomplished through a gear shifting box.

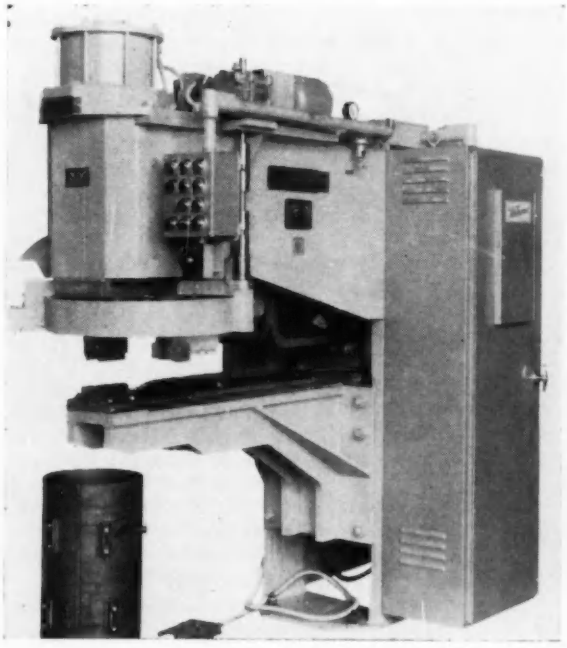
The rear view (insert) identifies the 14 in. movement on the heavy duty dovetailed slide with motor driven power traverse, with disengaging clutch for final manual (Hand Wheel) setting.

This slide is equipped with a micrometer dial, gauge bars and vernier scales for setting the milling cutter position. *The Standard Electrical Tool Co.*

Circle 53 on Inquiry Card for more data

Welder Equipped With Special Dial Type Holder

AFTER the operator has selected the proper station together with its pressure and heat and time setting, he will manually position the tank or part and initiate the machine by means of a two position foot switch.



This press type projection welder is equipped with a special four station dial type upper die holder. This arrangement, valving, regulating and piping allows selecting four different weld forces through a four button push button station. The four push buttons will permit the operator to choose any one of the four stations by simply pressing its button. The special four station dial type upper head automatically moves the die selected to the weld station. The proper air pressure for this particular station will also be selected automatically as well as the particular heat setting on the control panel.

The first position on this foot switch will bring the head down only and then he can check the position of the part before welding. The second position initiates the weld timer sequence.

This machine has a throat depth of 48 in. from the center line of the slide to the front face of the frame and the lower arm is made of fabricated steel with a cast copper conductor. This arm is designed to accommodate several different diameters and lengths of tanks and still maintain maximum strength with minimum deflection. The machine is powered with a 500 KVA water cooled welding transformer arranged with 16 steps of heat regulation. It is capable of providing a maximum secondary short circuit amperage of 100,000 amps.

The machine has an anti-friction roller bearing slide operated by a 12 in. diameter air cylinder developing a maximum weld force of approximately 9000 lbs at 80 psi air line pressure. *The Federal Machine & Welder Co.*

Circle 54 on Inquiry Card for more data

One Motion Lathe

A new Precision turret lathe features "one motion control." With this unit a single lever starts the lathe spindle and selects any speed up to 4800 rpm. The same lever will change speed during operation or instantly stop or reverse spindle. A push button on the knob of this same lever opens and closes collet or step chuck. Stops may be set for repeating selected speeds. Instantly reversing spindle is valuable for quickly retracting taps and dies.

The automatic indexing turret has hardened steel slides, and head is supported by large, rigid anti-friction bearings. Turret slide passes over top of double tool cross slide and can be adjusted, both vertically and horizontally, for accurate alignment of turret head to spindle. *Rivett Lathe and Grinder, Inc.*

Circle 58 on Inquiry Card for more data

Machine Grinds Non-Cylindrical Shaped Housings

An automatic axle housing grinder grinds weld flashing from square and non-cylindrical shaped workpieces. It can also be employed in grinding bars and shafts that are not round.

Basically, this unit consists of two adjustable grinding heads mounted on a reciprocating slide and a pivoting work holding assembly with two live centers which positions and rotates the axle housing during the grinding operation.

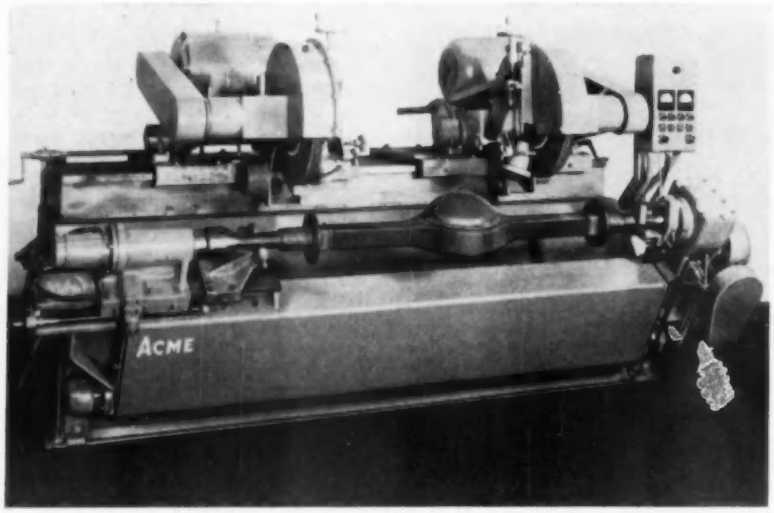
The grinding wheels are controlled by a floating cam action that follows the contour of the axle housing. The reciprocating action of the grinding wheels insures uniform wheel wear.

One of the live centers on the work holding assembly transmits rotation to the axle housing during grinding operations while an adjustable steady rest, which houses the other live center, supports the opposite end of the housing. The steady rest assembly is actuated transversely by a pneumatic cylinder for loading and unloading axle housings.

An automatic timer controls the grinding cycle. Grinding time can be set from 10 seconds up to 20 minutes depending on the grinding application.

In operation, axle housings are mounted on brackets between the live centers on the pivoting work holding assembly. The steady rest mechanism then moves transversely and locates the axle housing on the live centers. The work holding assembly then moves into grinding position. As the work holding assembly pivots, the axle housing is rotated and the grinding wheels start reciprocating. When the housing is pivoted into grinding position the grinding wheels immediately contact the weld flash on the housings. Upon completion of the grinding operation, the housing pivots outward from the grinding wheels to the unload position. *Acme Mfg. Co.*

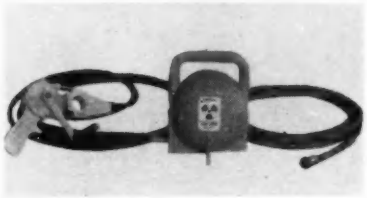
Circle 59 on Inquiry Card for more data



This unit has two grinding heads that are powered by 7½ hp motors. The machine occupies approximately 5 by 12 ft of floor space and is 5 ft high.

Iridium Cameras

Five different models are available in a new line of radiography cameras. Employing iridium 192 as a source, the line has a range of 10 to 100 curies. Designed primarily for



internal and panoramic inspection, these units will handle steel from ¼ to 3 in. and aluminum from ¾ to 9 in. All the units in this line are portable and require no external source or cooling. Hand truck mounts are available as an optional extra. *Radionics, Inc.*

Circle 60 on Inquiry Card for more data

Automatic Loader

The development of a new Red Ring automatic loader that permits unsymmetrical parts to be easily and accurately gaged for size before entry into the input chute is announced.

The slide-type loader, which can be used to automatically feed and unload parts from rotary gear shaving or gear tooth honing machines, is ideally adapted to the handling of such parts as transmission clutch gears. The size check at the entrance to the input chute is made by passing the gear on the end of such a shaft-type part between two master gears.

This new development utilizes the Red Ring patented meshing principle. The lower master gear is equipped with radial fingers on which the shaft portion of the gear rests as it is being passed through the gaging master gears. This design avoids part positioning errors that make it difficult to gage unsymmetrical parts.

The loader is operated by an air cylinder that actuates a slide. Parts are automatically fed one-at-a-time at spaced intervals into machining position, clamped between centers, processed in a controlled machining cycle, unclamped and carried into an exit chute where they roll to the front of the machine for either operator or conveyor pickup. *National Broach and Machine Co.*

Circle 61 on Inquiry Card for more data

(*Turn to page 90, please*)

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR

All-Butyl Tire

Called the Butylride, a new passenger tire made from butyl rubber is said to offer an extremely quiet ride and no squeal on turns. The tire was designed with a heavily inserted center rib almost the full width of the tire. This design was chosen to give the tire good stability. Two narrow ribs flank the big center tread row. Butylride is a tubeless tire made with rayon cord. It comes with a whitewall less than an inch wide and is available in a full range of 14 and 15 inch sizes. *United States Rubber Co.*

Circle 33 on Inquiry Card for more data

Translucent Tire

The production of a colored translucent tire by pouring the ingredients into a mold, such as are used with molten steel, has been announced. Prototype tires have been road tested at speeds up to 65 mph, the manufacturer reported.

Walter Lee, tire research and development director for Goodyear, stated that the new line will not be available to the market for several years, or possibly a decade.

Capable of being lighted from within, the tire has no fabric, splices or layers in its construction. The tubeless experimental models are made of specially compounded neothane, a polyurethane rubber. In making an experimental tire the engineers add dye to a batch of neothane and pour the mixture into a special mold. After curing in an oven, the tire is removed, ready for service.

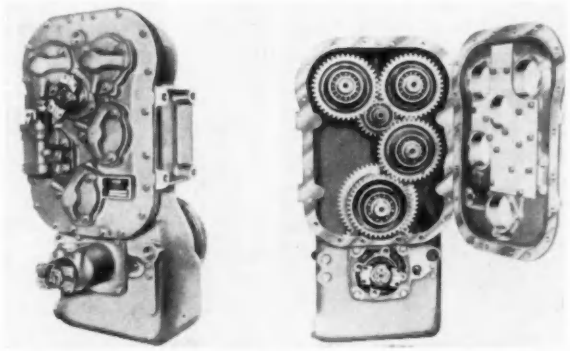
The colored tire would allow the designer to carry the color scheme from the roof to the road. A safety factor is pointed out by Goodyear in the illuminated version. *Goodyear Tire and Rubber Co.*

Circle 34 on Inquiry Card for more data

Power Shift Transmission for Off-The-Road Equipment

Designated the 2000 series, a new power transmission has been developed for application on small off-the-road equipment. The new unit is designed for use with the Clarke 270 series torque converter. This transmission can be employed with gasoline or diesel engines of approximately 2000 lb ft torque output.

The transmission is adaptable for either two or four wheel drive with the sump for the converter. Hydraulic power to operate the clutches is supplied by a pump mounted on the torque converter. Two more pumps may be mounted on the converter to provide hydraulic power for auxiliary operations.



All four clutch packs are identical on this unit to simplify maintenance. Four bolt side mounts are provided for ease of installation and removal. However, all major internal components are accessible, without dropping the transmission, by removing the back cover plate.

The transmission, according to the manufacturer, has been accepted for use on several new lines of front end loaders, lift trucks and rollers. Company engineers report other potential applications would include motor graders, tractors and other various construction vehicles.

The transmission is lubricated by the torque oil converter and serves as output shaft 17 in. below the input shaft. The engine may be located in the front or rear of the vehicle. Front or rear wheel disconnect for operation in two or four wheel drive is an optional feature. Parking brake and automatic clutch release also are available.

Clark Equipment Co.

Circle 35 on Inquiry Card for more data

Nylon Tire Valve

Named Glo-Cap, a new tire valve has been designed to prevent valve stem swallowing in the event of a run flat in dual wheel operation. This device screws down tight to the valve stem to prevent the stem from being pulled into the tire and also serves as a heavy duty valve cap to prevent damage to the valve core. It is manufactured from fluorescent nylon—Plaskon 8202. *National Aniline Div., Allied Chemical Corp.*

Circle 36 on Inquiry Card for more data

Anti-Smog Device

Announcement has been made of the development of a smog-burner device which is designed to eliminate hydrocarbon gases from automobile engines. Known as the Mark IX, this unit operates on a mechanical principle involving a single moving part. According to the manufacturer, the smog-burner will have no adverse effects on gasoline mileage and will require no complicated inspection to see if it is functioning properly.

The burning process originates with a spark plug which ignites the hydrocarbon gases in a cone shaped chamber. The spark plug is attached to the car's ignition system. *Chromalloy Corp.*

Circle 37 on Inquiry Card for more data

Auto-body Seal

One-piece rubber extrusions combining longitudinal sections of two different durometers have been developed by a new process, the manufacturer reports. The hard-soft extrusions are suitable for such automotive body applications as belt line seals, door seals, molding, and other weatherstripping. The new material incorporates a soft rubber of the desired shape to meet the actual sealing requirement and a hard rubber foot for ease of mounting to the support panel.

In the illustration, the soft wiper section (white) of the sealing strip is of 60 durometer hardness while the base is 90. The hard section is flexible enough to fit body curves but rigid enough to secure anchorage to the body by adhesive, clip or other fasteners. Clips, for instance, can be prestaked into the hard portion to facilitate minimum final assembly operation time. *Geauga Industries Co.*

Circle 38 on Inquiry Card for more data

Carburetor Valve

A newly developed valve, designed to end carburetor flooding, has a tip made from *DuPont's* new Viton. Resilient properties of the new material permit perfect sealing of the valve and seat despite the presence of contaminating particles in the fuel. Erosion and "pounding" of the valve and seat sealing surfaces from engine vibration and fuel contaminants also are eliminated. More than two years of intensive development and endurance testing have gone into this new valve. A *Holley* spokesman reported "Its excellent resistance to abrasion and high heat, as well as its aging properties, make Viton the ideal material for use in fuel inlet valves." *Holley Carburetor Co.*

Circle 41 on Inquiry Card for more data

Automatic Fan Drive

An automatic fan drive for heavy-duty International V-8 truck engines has been announced. It will be available for six cylinder models in the near future.

The new drive is an electro-magnetic clutch located behind the fan. It is activated by a highly sensitive thermostatic control located in the coolant stream. This control is pre-set to engage and disengage the clutch between desired engine operating temperature limits.

Automatic engaging of the clutch when the coolant temperature reaches a maximum desired temperature results in normal fan operation. When the coolant temperature drops to normal, the fan automatically becomes free wheeling. This frees as much as 12 per cent of usable engine horsepower.

In addition to fuel savings up to 10 per cent, automatic fan drive aids in easier engine starting, quicker warm-ups, longer belt life, better vehicle heating and substantial noise reduction.

It also permits the engine to operate consistently in the most efficient coolant temperature range, thereby stabilizing operating temperatures and producing better overall performance with less oil sludging and less wear. *Motor Truck Div., International Harvester Co.*

Circle 39 on Inquiry Card for more data

Oil Filtering Element

A new lubrication oil filter element featuring a considerable increase in filtration efficiency without a loss in service life has been announced.

The new element, known as 7M 3800, is a paper element which removes an even greater percentage of impurities than was possible with the highly-efficient 9F 6700 element, which it replaces. In addition, it retains the full service life of the earlier unit. Heretofore an increase in the impurity removing ability of a filter element resulted in a shortening of the service life or recommended element change period.

A definite advance in filter design, the new element represents two years of research and development.

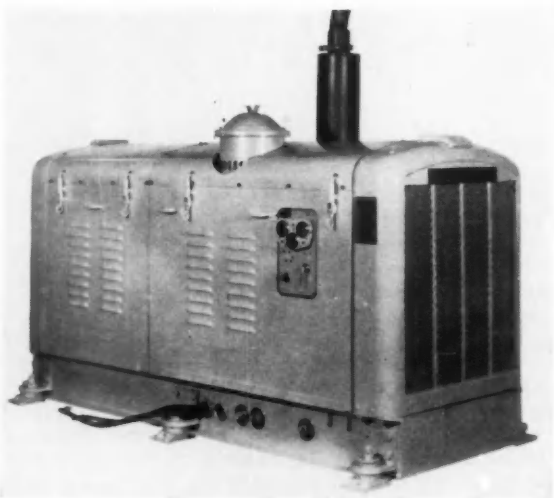
Outward appearance and dimensions of the new filter element are unchanged, as is the unit cost. The developments making possible the greater degree of impurity removal are found in construction of the filtering paper, which is considerably stronger, thicker and removes more contaminants from the oil than earlier materials.

An additional feature of the new element is "deep grooving" of the filtering paper to maintain proper fold separation. This insures that full filtering area will be maintained throughout the life of the element. *Caterpillar Tractor Co.*

Circle 40 on Inquiry Card for more data

Diesel-Electric Units for Material Handling Trucks

A new series of heavy-duty diesel-electric power unit for large materials handling trucks has been introduced. Designed especially for use on industrial trucks from 15,000 to 80,000 lbs., these big Ready-Power units are said to combine low-operating cost with maintenance-free operation.
The Ready Power Co.



Included in the new series are three models which are designed around GM Diesel engine models 471, 371 and 353. Units are operated at constant speeds, with variable voltage control providing the desired power output. Hydraulic power for this Diesel unit is supplied by a direct-driven pump on the engine which assures a constant supply of power for all hydraulic operations.

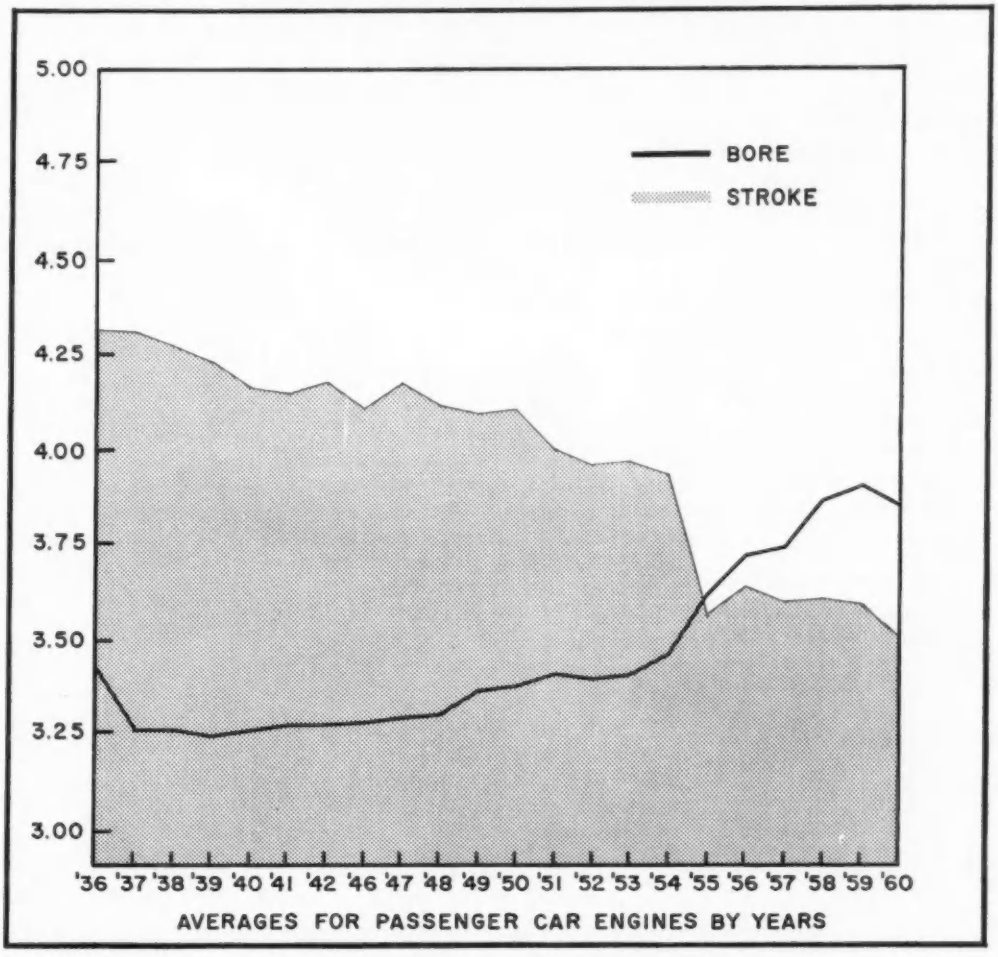
Circle 42 on Inquiry Card for more data

A.I. / AUTO-TECHNICS DATA SHEETS

Basic Automotive Design and Production

TECHNICAL DATA FOR PERMANENT REFERENCE

Bore, Stroke, and Displacement, 1936-1960



Bore, Stroke and Displacement

	BORE (IN.)	STROKE (IN.)	DISP. (CU. IN.)
1936	3.39	4.32	267.9
1937	3.25	4.31	277.6
1938	3.25	4.27	271.1
1939	3.24	4.23	255.3
1940	3.25	4.17	254.0
1941	3.26	4.15	252.1
1942	3.26	4.18	251.8
1946	3.27	4.11	246.4
1947	3.28	4.18	250.4
1948	3.29	4.12	247.1
1949	3.35	4.10	250.0
1950	3.37	4.11	256.1
1951	3.40	4.00	250.4
1952	3.39	3.96	251.6
1953	3.40	3.97	241.4
1954	3.46	3.93	249.5
1955	3.62	3.57	271.8
1956	3.72	3.63	297.3
1957	3.74	3.60	304.1
1958	3.86	3.61	325.9
1959	3.90	3.59	329.2
1960	3.84	3.51	310.2

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News of the MACHINERY INDUSTRIES

November Machine Tool Orders Totaled $49.65 Million Net, Down from October's $56.2 Million. Orders for Year 1960 Vs. 1959 Were Slightly Less, Shipments Considerably More

By Charles A. Weinert

Machine Tool Orders Only Fair in November

Machine tool orders booked in November amounted to $49.65 million net, according to latest preliminary figures for the month released by the National Machine Tool Builders' Assn.

This November total for both cutting and forming type machines showed a decline of $6.55 million from October's total of $56.2 million. Nevertheless, the cutting-machine net new order sector at $39.75 million was $4.15 million above October's $35.6 million of cutting-machine orders.

Domestic net new orders for cutting machines, booked in November, are computed at $26.7 million, while foreign orders are listed at $13.05 million. The October final equivalents are $25.55 million domestic and $10.05 million foreign.

Forming-type machines marked up losses both in domestic and foreign orders. Net new orders in November were $8.4 million domestic and $1.5 million foreign, totaling $9.9 million. For October the figures were $17.1 million domestic and $3.5 million foreign, for a total of $20.6 million. However, it should be pointed out that October's $17.1 million of domestic net new order receipts represented by far the best month of the year. Further, that the average monthly value of all forming-machine orders for the first nine months was about $12 million.

In summary, therefore, cutting-type machines showed a gain in net new orders, November over October, of about 12 per cent; forming-type machines had a loss in orders of about 52 per cent; and overall, for both types of machines combined, the net loss was 11.6 per cent, November versus October.

Ludlow King, NMTBA executive vice-president, reports that **domestic net** new orders for **cutting-type** machines, at $323.4 million for the first 11 months of 1960, were 20 per cent below those booked in the same period of 1959—and lower than the volumes in any of the prior 10 years with the exception of 1958. On the other hand, **foreign** net order receipts at $132.25 million were more than doubled—up 129 per cent over 1959, and at the highest level since 1951.

Mr. King also reports that **domestic** net new orders for **forming type** machines, at $104.65 million for the 11 months of 1960, are off eight per cent from the same period of 1959—but up 58 per cent over the same period of 1958. **Foreign** net new orders totaled $33.55 million during the first 11 months—up 47 per cent over the same period of 1959, and up 146 per cent over 1958.

Assuming the December results, when compiled, will equal the averages of the prior three months, the Year 1960 net new orders for cutting-type machines will amount to about $495 million, and those for forming-type machines will amount to $152 million, for a grand total of $647 million.

For 1959, the respective yearly figures were $509 million cutting and $149.95 million forming, for a grand total of $658.95 million.

Overall, therefore, net new orders booked in 1960, versus 1959, apparently were less to the extent of about $12 million, or 1.8 per cent.

On shipments, the November preliminary figure for both types of machines is $48.05 million—compared to October's $51.35 million.

The total for the year will show

METAL CUTTING AND FORMING MACHINE TOOLS

Net New Order Receipts, and Shipments

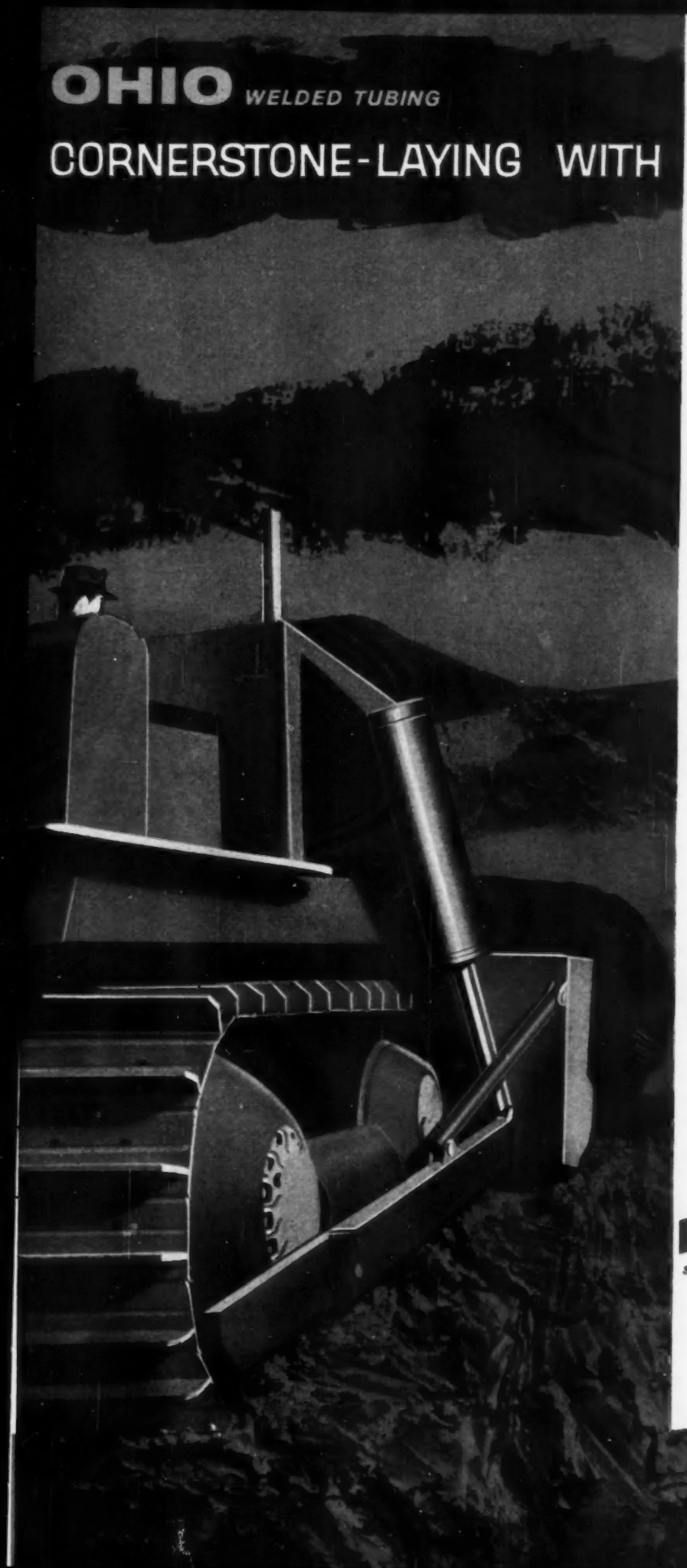
(Millions of Dollars)

	Net New Orders			Shipments		
1960	Cutting	Forming	Totals	Cutting	Forming	Totals
Jan.	$43.45	$13.00	$56.45	$36.75	$ 9.65	$46.40
Feb.	47.70	12.90	60.60	40.00	11.95	51.95
March	48.45	13.50	61.95	51.05	13.45	64.50
April	36.70	15.15	51.85	43.95	11.15	55.10
May	37.95	12.00	49.95	44.30	12.05	56.35
June	42.60	12.50	55.10	48.40	14.70	63.10
July	33.50	9.45	42.95	39.45	11.85	51.30
Aug.	47.80	9.05	56.85	36.50	11.40	47.90
Sept.	42.15	10.15	52.30	41.00	12.95	53.95
Oct.	35.60	20.60	56.20	40.65	10.70	51.35
Nov.	39.75*	9.90*	49.65*	36.95*	11.10*	48.05*
11 Mos.	455.65*	138.20*	593.85*	459.00*	130.95*	589.95*

* Preliminary.

Source of Statistics: National Machine Tool Builders' Assn.

Circle 141 on Inquiry Card for more data ⟶



OHIO *WELDED TUBING*

CORNERSTONE-LAYING WITH

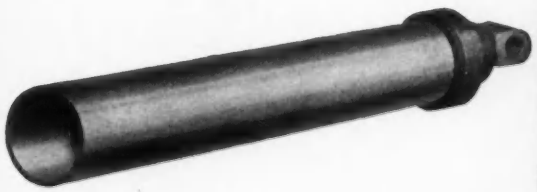
NO CEREMONY

In today's hustling, bustling construction business there's no time to stand on ceremony . . . no point in risking costly equipment failure.

To short-circuit mechanical downtime, leading construction equipment producers specify Ohio Tubing for power cylinders and fluid lines, mechanical and structural members. This gives equipment the heft and brawn to shrug off brutal, grinding punishment . . . gives equipment users a high degree of protection against disastrous delays.

You can strengthen your product — and its mechanical reputation — by specifying Ohio *Custom Made* Tubing. The name Ohio is the hallmark of the highest quality in tubing, both seamless and welded. And we're now able to deliver a broader range of welded tubing sizes, wall thicknesses and grades than ever before.

Let's not stand on ceremony. We want your tubing business — seamless to 7″ OD, *welded up to 7½″ OD.* For a fast start, contact your nearest Ohio representative, or send part drawings to the plant at *Shelby, Ohio—Birthplace of the Seamless Steel Tube Industry In America.*



Ohio Seamless offers the broadest parallel range of both welded and seamless quality steel tubing in the industry.

OHIO SEAMLESS TUBE

Division of Copperweld Steel Company • **SHELBY, OHIO**

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

Representatives in principal cities. Check leading directories: THOMAS', MacRAE'S, CONOVER-MAST, SWEET'S, FRASER'S.

A-3305A

a considerable gain over 1959. Again assuming the figures for the month of December will fall within the prior three months' average, shipments for the Year 1960 are likely to amount to $498 million cutting and $142 million forming, for a grand total of $640 million.

For 1959, the yearly volumes of shipments were $413.05 million cutting and $125.1 million forming, for a total of $538.15 million.

The gain on shipments is consequently very apt to be about $100 million—or 19 per cent over 1959.

Clearing Reports Good Business Volume

At a press conference held in Chicago late in December, officials of Clearing Division of U. S. Industries, Inc., were quite optimistic about business prospects.

Primarily, the occasion was called to mark the completion of a big double-acting press built for the Isuzu Motors Co., Ltd., at Yokohama, Japan. Isuzu specializes in the production of Diesel buses and two to six-ton trucks. This company also makes Hillman-Minx automobiles under license.

The huge press has a max capacity of 600 metric tons, weighs about 650,000 lb, and has a height from floor line of over 30 ft. Of all-welded-steel design and totally enclosed, it incorporates moving bolsters for quick die changes.

In addition to the big press, Clearing has been building four smaller single-acting presses for Isuzu. All five are scheduled for shipment within the next few weeks.

Price of the big press is about $435,000. For the entire five, the order totaled around $1.3 million.

Another sizable foreign order in process at Clearing is one for Nissan Motors, Ltd., Japan. The order calls for a complete line of automatic presses, with tooling. It is scheduled for completion in about a year. These presses will be used to produce front fenders and fender parts.

John R. Bartizal, president of Clearing, commented at the press conference, "It will be difficult for 1961 not to be one of our best years." He indicated the company would start the year with an excellent backlog of orders in the shop.

This favorable outlook is apparently due in large measure to the company's international operations, which consist both of manufacturing abroad and exports from the Chicago plant. Mr. Bartizal said all of Clearing's foreign subsidiary plants have substantial backlogs, running to 22 months in some instances, and that because of these backlogs abroad, the Chicago plant's business was good—foreign customers place orders here to get quicker delivery.

Clearing has been very active in foreign markets, having supplied presses to almost every major automobile manufacturer in the world. Customers include Peugeot, Simca, Renault, Opel, Volkswagen, Saab, Fiat, Daimler-Benz, the British Motors group, Ford of England, Lancia, Alfa Romeo, and makers in Australia and India, as well as in Japan.

Mr. Bartizal further indicated that domestic business also was good, and that orders from American automotive manufacturers were now in the company's shop.

Meet the AI By-Liners

A brief biographical sketch of one of the editors and contributors to AI who participates regularly

Introducing

Harold M. Nelson

HAROLD M. NELSON has been Specifications Editor of AUTOMOTIVE INDUSTRIES for nine years, serving as assistant to Marcus Ainsworth, AI Statistical Editor. Harold's job is to formulate and present the detailed specifications tables on passenger cars, trucks, buses, aircraft, tractors, engines, bodies, etc., which appear in AUTOMOTIVE INDUSTRIES' Annual Statistical issues—as well as in other issues throughout the year.

Besides his work on AI, Harold is Specifications Editor of other Chilton magazines as well:—*Commercial Car Journal, Motor Age, Aircraft & Missiles,* and *Distribution Age.*

Before coming to Chilton, Harold was for three years with an automotive wholesale parts jobber, in which position he served as a counterman scheduling parts and machine shop services.

He is a former assistant chief of the Upper Darby, Pa., Fire Department, in which he continues most active, and is also an enthusiastic small game and deer hunter.

Growing Preference at Nation-Wide Fleets Proves

THE TREND IS TO LIPE

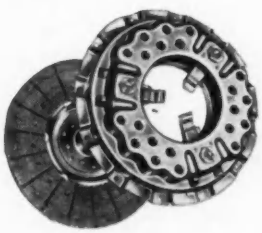
Miller Motor Express of Charlotte, N. C. has installed Lipe Clutches in 40 units. More are in process.

Month by month, year by year, the increasing number and size of orders for Lipe Heavy-Duty DPB Clutches bears out the growing preference of fleet men.

This preference is soundly based on the fleet men's own experience. They try DPB's. They keep performance and maintenance records. They compare. And the results are plain to see:

More ton-miles per year . . . more engagements between shop-stops . . . lower cost of maintenance when maintenance *is* necessary. By any yardstick of costs, these are figures difficult to dispute.

And they all add up to another indisputable fact: *The trend is to* LIPE.

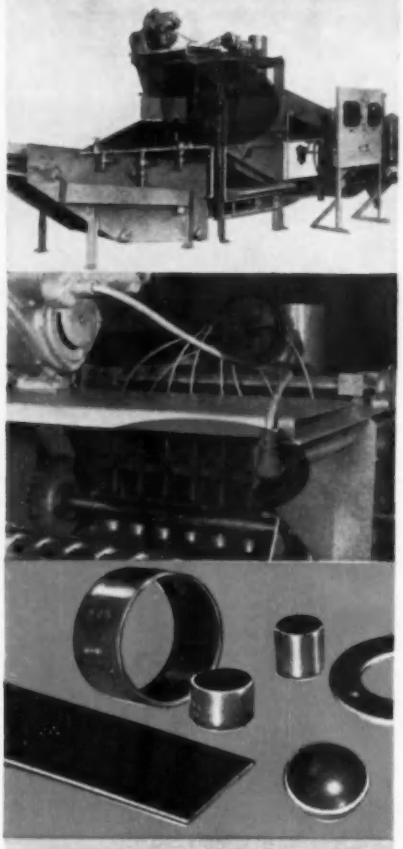


There is a Lipe clutch to meet requirements of vehicles 18,000 lbs. GVW and up; for torque capacities from 200 to 3000 ft. lbs. For application assistance and specific data, contact the company direct.

LIPE-ROLLWAY CORPORATION
SYRACUSE 1, N. Y.

Circle 142 on Inquiry Card for more data

EXAMPLE #4



DU bushings (bottom), used in the drive head housing and hold down assemblies of the blossom trimmer (center), help increase life, reduce downtime of the Model 300 Tomato Peeler (top) made by Food Machinery and Chemical Corporation.

DU* DRY BEARINGS

Solve Another Problem

"We switched from bronze to DU material because of the longer life of DU with the added bonus of no lubrication. In the first year, the material has worked out very satisfactorily."

Sandor Csimma
Project Engineer
Food Machinery & Chemical Corporation

For bushings on the blossom trimmer portion of their Model 300 Tomato Peeler, DU material is proving to be the logical choice for Food Machinery and Chemical Corporation of San Jose, Cal. Under typical cannery conditions of varying temperatures, moisture and corrosion, the DU bushings operate successfully at an average bearing load of 50 p.s.i., and on an application requiring a service life of 3,000 hours over a five-year period.

DU metal is an ideal bearing material for many applications. It withstands much higher velocities, runs much cooler at lower speeds than other unlubricated bearings . . . has a compressive strength of 51,000 p.s.i. DU metal is applied without the need for temperature-limiting adhesives . . . will withstand from −450°F to +536°F.

GARLOCK

Apply DU dry bearings to appliances, automobiles, aircraft, farm and industrial machinery, office equipment. Standard bushings and thrust washers available for ¼" to 5" shafts; strip available for special fabrication. Write for engineering catalog DU-458. Special Products Dept., Garlock Inc., P.O. Box 612, Camden 1, New Jersey.

*Trademark, Glacier Metal Company, Ltd.

1961 Marine Engines

(*Continued from page* 67)

der 15 and 5 hp, and the single-cylinder 3 hp.

All models from the Buccaneer 5 through the V-Sovereign are arranged for remote controls, and have full gearshift. Sealed fiberglass shrouds also are used.

Johnson Motors

The Johnson line of outboard motors for 1961 ranges from 3 to 75 hp, continuing the top rating introduced last year with added features.

Two 75-hp Sea-Horses head the list of new models. These are V-4's having a bore of 3⅜ in. and a stroke of 2½ in. Total piston displacement is 89.5 cu in.; and max rating is at 4500 rpm.

The deluxe Super Sea-Horse V-75A is fitted with a brand new 20-amp alternator coupled with silicon diode rectifiers and a transistorized voltage regulator. Other innovations are fixed high-speed carburetor jets, temperature-warning and ignition-key-switch lights, and fiberglass covers with sound-absorbing blankets.

The companion Super Sea-Horse V-75, likewise electric-starting, has the above new features except for the alternator. In its place, a regular generator kit is available as an accessory.

Base weights of these 75-hp models, for 15-in. transom units, are respectively 244 and 224 lb.

Coming next in the Johnson line are the two Super Sea-Horse 40's, one electric starting and the other manual starting, rated 40 hp at 4500 rpm. They have a bore and stroke of 3 3/16 x 2¾ in., for a total displacement in two cylinders of 43.9 cu in. Base weights are 146 and 132 lb. These units similarly have new fixed high-speed carburetor jets, and sound-absorbent covers.

Thermostatically-controlled recirculating system, automatic choke, and key switch starting are features common to all three electric-starting models.

Johnson's 1961 line also comprises the manual-starting Sea-Horse 18, 10, 5½, and 3 hp models, all twin-cylinder motors.

(*Turn to page* 112, *please*)

Circle 143 on Inquiry Card for more data

Circle 144 on Inquiry Card for more data

One Lamb FHP motor...up to 100,000 carbon copies mass-produced to exacting specifications

From a prototype . . . hundreds OR thousands of motors with absolute uniformity. Each and every motor produced has the same, discriminating, "built-in" perfection that you can expect with Lamb® manufacturing. This precise mechanical and dimensional uniformity of motor as an integral component for your powered product is extremely important . . . and Lamb makes sure you get it!

If you have a special motor problem . . . here's what you can expect from Lamb! *Into the design* of a Lamb motor goes years of experience in powering components for aircraft, domestic and industrial products. *Out of the design* comes a personalized motor that's dependable, smooth and efficient.

Cost-wise you're way ahead, because Lamb Motors are mass-produced at the most favorable cost.

Write today for descriptive folder. Or ask to have a District Engineer call and set up a personalized "Motor Conference".

THE LAMB ELECTRIC COMPANY · Kent, Ohio
A Division of American Machine and Metals, Inc.
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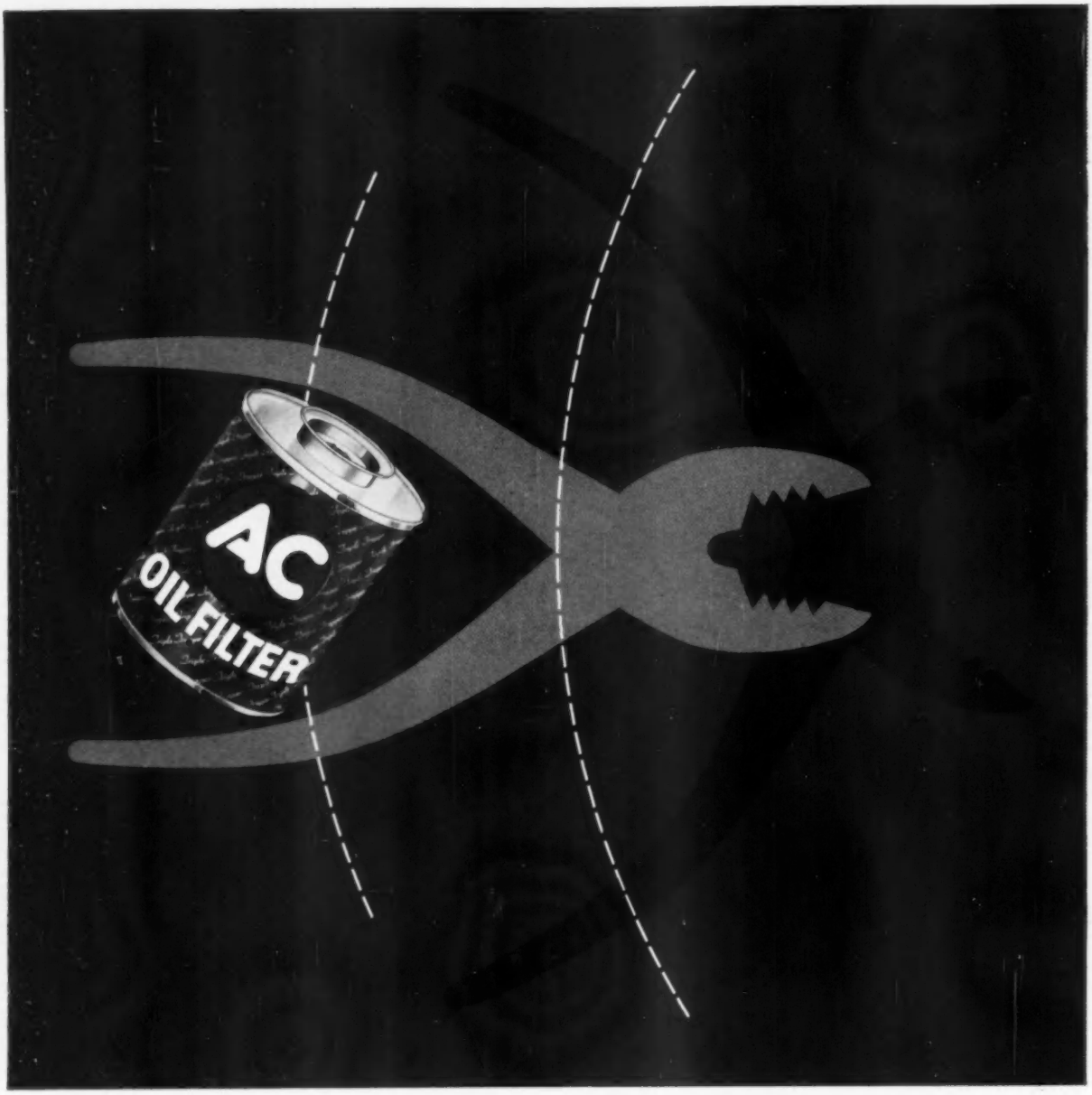
Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER **MOTORS**

Divisions of American Machine and Metals, Inc., New York 7, New York TROY LAUNDRY MACHINERY
RIEHLE TESTING MACHINES • DE BOTHEZAT FANS • TOLHURST CENTRIFUGALS • FILTRATION ENGINEERS • FILTRATION FABRICS
NIAGARA FILTERS • UNITED STATES GAUGE • RAHM INSTRUMENTS • LAMB ELECTRIC CO. • HUNTER SPRING CO. • GLASER-STEERS CORP.

YOU CAN'T BEAT AC FOR PRODUCT KNOWLEDGE



These facts will give you a better grip in determining your Oil Filter needs

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Blower Fans Balanced at Chrysler Airtemp Using Cost-Saving Techniques

IN Chrysler Corporation's Airtemp Div. plant at Dayton, Ohio, unique cost-saving equipment is being employed for balancing blower fans and wheels. These light-weight components are used on automotive heater and defroster motors having operating speeds ranging up to 4400 rpm. Consequently, the parts require precise balance to assure quiet, vibration-free performance. At the same time, cost and output are other major considerations.

In this setup a Gisholt HSV (high-speed, vertical) Balancer—one of a line of both vertical and horizontal models designed specifically for balancing small high-speed parts—is being utilized. The machine measures the amount of unbalance in the rotating workpiece, and also shows the location of unbalance. Unbalances which cause work-support vibrating movement greater than 0.000002 in. are measured and located.

During rotation of the workpiece, the angle of unbalance is indicated by a strobe lamp focused on a graduated disk. This disk rotates with the workpiece, which is located and setscrew-held on a simple adapter. Thus, the strobe lamp causes one point on the numbered disk to appear stationary at the correction location.

The amount of unbalance is shown on a direct-reading meter which indicates the weight of aluminum clip needed to provide inbalance. This clip is then crimped to one of the vanes in the angular position indicated by the strobe lamp. Since the amount of unbalance is shown "in terms of the correction method used," a second rotation for inspecting the work has been found unnecessary.

According to reports, accuracy requirements are being met, along with a saving in processing time of 50 per cent compared to prior methods. Output at Chrysler is at the rate of about 60 pieces per hour. ■

Gisholt HSV small-parts balancer is being used at Chrysler's Airtemp Div. plant for measuring the amount and showing the location of unbalance in heater and defroster fans. Corrections are made by crimping on aluminum clips. The part shown on the machine is a defroster blower wheel 3¼-in. diam, weighing four ounces.

Fisher to Expand

Fisher Body Div. is planning an estimated $10 million expansion program at its Hamilton, O., stamping plant, adding 214,000 sq. ft. of floor space. The program will increase the plant's working area by 17 per cent.

Included in the program will be new presses, scrap handling facilities and cranes. Work is slated to begin immediately, with completion scheduled by next fall. The Hamilton plant produces rear quarter panels, floor pans, doors and roof panels for all five GM car lines.

I-H to Close Plant

The small Rock Falls, Ill., farm implement plant of International Harvester Co. will close by the end of next year, Mark V. Keeler, vice president, Farm Equipment Div., has announced.

Mr. Keeler also revealed that gray iron production at the Canton, Ill., works will be shifted to five other large company foundries by May. This will provide 125,000 sq ft of floor space for production needs.

Air Force Seeks Industrial Mobilization

(*Continued from page* 49)

utilization of programmed equipment is about 80 to 90 per cent. This economic fact plus the greatly decreased space required for numerically controlled machines makes the newer generation equipment most attractive from every standpoint.

Objectives Listed

The Air Force objective can be broken down into the following categories:

1. Modernization by the acquisition of new equipment.
2. Modernization by acquiring from reserves a non-comparable replacement.
3. Modernization by upgrading present equipment.
4. Replacement from reserve by a comparable or reasonable substitute for equipment being replaced.

The basis for justification of new acquisitions has been made simple, although it involves a complete and authenticated cost analysis, using a standardized ASC form. This is essential in justifying the purchase of expensive equipment. However, where the savings to be realized do not warrant the cost of preparing the analysis, this economic study is not required.

One major complication that must be resolved is that the Air Force owns only a minor portion of a contractor's facilities. The bulk of facilities are privately owned. What it comes down to is that the private facilities must be suitably upgraded at the same time if the full value of the modernization program is to be realized.

Significant Advantages

The Air Force presentation shows some significant advantages of numerically controlled equipment as compared with the best of the earlier generation of equipment for the same purpose. One example is the milling of the B-52 G lower wing panel. A well known tracer controlled spar mill takes almost 600 hours to do the job whereas a numerically controlled skin mill takes less than 200 hours. In another instance, the milling of a large and intricate spar by conventional methods costs from $3600 to $7200. The same job, handled with numerical control, was produced for $455.

In the case of the Republic F-108 wing panel, conventional methods required 211 hours and a cost of some $1800, whereas numerical control produced the same part in 2.5 hours at a cost of $20. Moreover, this method resulted in a weight saving of 10 per cent.

The interesting point is that the principles involved in the Air Force program can be applied to automotive plants producing vehicles and parts. While numerical control does not lend itself to strictly automotive production on parts made in huge numbers, Detroit Diesel has been using the K & T Milwaukee-Matic machine for more than a year. It has been programming a wide variety of

(*Turn to page* 100, *please*)

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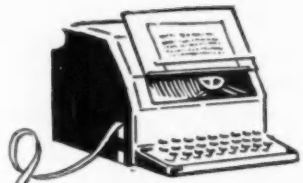

ON OUR WASHINGTON WIRE

Construction and expansion of industrial plants is the basic action which will come from government aid to economically depressed areas. One of the prime parts of the depressed areas aid program is a provision for more than $300 million in low-interest loans to chronic labor surplus areas to attract new industries or expand existing companies. Other major sections of the program—special public works projects, tax write-offs, more defense money for the areas—are geared toward industry buildup.

President-elect John F. Kennedy's top priority legislative program may not fare as well as he hopes. The five-point program he wants Congress to speedily approve will be a test of the new President's strength. Aid to depressed areas is expected to get quick approval. However, there is opposition to Federal aid to education, a $1.25 minimum wage, more funds for slum clearance, and medical care for the aged.

Last year's "get tough" policy of government antitrusters will get even tougher in 1961. Business can expect new legislation giving the Justice Department more power. One measure, backed by the Justice Department, would require advance notice to Federal agencies of corporation mergers. Another would give the department power to seize industry records on suspicion of an antitrust violation.

The Nation's civilian space agency will get $185 million more to spend next year. It will put the budget of the National Aeronautics and Space Administration at $1.1 billion for fiscal 1962. President Eisenhower will request the increase and the Kennedy administration is not expected to seek a change until after a review of civilian and military space programs.

Congress is studying the problem of protecting privately-owned patents on technological information the government shares with its allies. Preliminary studies by a Senate subcommittee call for further study of problems connected with the interchange of technical information. Some of the information is patented or patentable; some falls in the category of trade secrets and "know-how."

Home owners will pay more for repair and upkeep this year says U. S. Commissioner of Labor Statistics Ewan Clague. He predicts a cost of living increase of one to two per cent, with most of the rise due to services. Sales of builders' hardware, electrical and plumbing supplies should increase as more home owners try to fix up the old house rather than buy a new one.

Circle 147 on Inquiry Card for more data

Guarantee your extended warranty with *the thread that takes care of itself!*

HELI-COIL® Wire Screw Thread Inserts —

- **provide permanent threads in all metals — even in aluminum and magnesium.**
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- **eliminate warranty period expense due to thread failure.**

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3110

Air Force Seeks Industrial Mobilization

(*Continued from page* 96)

parts required in small numbers. The single machine does the complete job effectively and efficiently.

Fisher Body Line

Another example is the moving bolster press line for short run stamping at the Fisher Body plant in Grand Rapids. This is used for making a variety of short run stampings. The major advantage is that a die change can be made for the entire line in half an hour. Several Bliss press lines of similar type already are being installed in other large plants.

Even the versatile transfer machines installed in recent years are being made obsolete by the newer transfer machines. These embody features of quality control, reliability and productivity plus added versatility eclipse older machines from the standpoint of economy. There are cases where the new machines are so superior as to outweigh the cost savings inherent in rebuilding the older machines.

3 Ways to Slash Fastening Costs with

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PALNUT Lock Nuts and Fasteners are precision-produced in enormous volume at exceptionally low cost. They are priced lower than other locking methods, often less than plain nuts.

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BOOKS . . .

OFF-THE-ROAD LOCOMOTION, *Research and Development in Terramechanics, by M. G. Bekker, published by University of Michigan Press, Ann Arbor, Mich. Price $10.* This book takes its place with the author's THEORY OF LAND LOCOMOTION as the first to offer systematic research on the vehicle as a unit in relation to environmental terrains. Mr. Bekker shows how predictions can be made of vehicle performance and design parameters and discusses soil and snow mechanics, tracks, wheels, and tires, as well as general factors having to do with vehicles at assumed optimum performance.

AERO MECHANIC'S QUESTIONNAIRE, *Fourth Edition, by Ralph Rice, published by Aero Publishers, Inc., Los Angeles 26, Calif. Price $6.50.* Aviation mechanics or anyone who has anything to do with the assembly, maintenance, airworthiness, and operation of aircraft should find this book of particular interest. It also is ideal for the student preparing to take his examinations for the aircraft mechanic's certificate. It contains 2225 multiple-choice type questions on all applicable subjects. They include powerplants, propellers, lubrication, carburetion, electricity, rigging, assembly, weight and balance, woodwork, fabrics and doping, hydraulics and sheet metal and welding.

AUTOMOTIVE INDUSTRIES ENGINEERING REPORT NO. 5 ON RELIABILITY AND QUALITY CONTROL, *published by Automotive Industries, 56th and Chestnut Sts., Philadelphia 39, Pa. Price $2.* Quality control leaders in the automobile industry show, with stories and photographs, how their companies continually work for improved products. Included are stories on the Chrysler Imperial; threaded fasteners at Buick; A. C. Spark Plug Div. reliability program; optical gaging techniques for Ford stud inspection; use of radioisotopes in automotive engineering; the use of X-rays by Ford scientists, and what the Army needs in new engines.

THE SCIENTIST IN AMERICAN INDUSTRY, *some Organizational Determinants in Manpower Utilization, by Dr. Simon Marcson, published by Industrial Relations Section, Princeton University, P. O. Box 248, Princeton, N. J. Price $3.* This is the first of a series of studies of different working environments as they affect scientific personnel in industry, government laboratories, and in universities throughout the country.

MATERIALS SELECTION FOR PROCESS PLANTS, *by Russell E. Gackenbach, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $8.50.* The problem of material selection as encountered by the engineering, maintenance and production personnel of process plants is explained. This book contains all necessary data on metals, plastics, rubbers, paints and cements. It discusses corrosion-resisting qualities along with the mechanical properties and fabricating characteristics that must be considered in selecting the most suitable and most economical material for a particular purpose.

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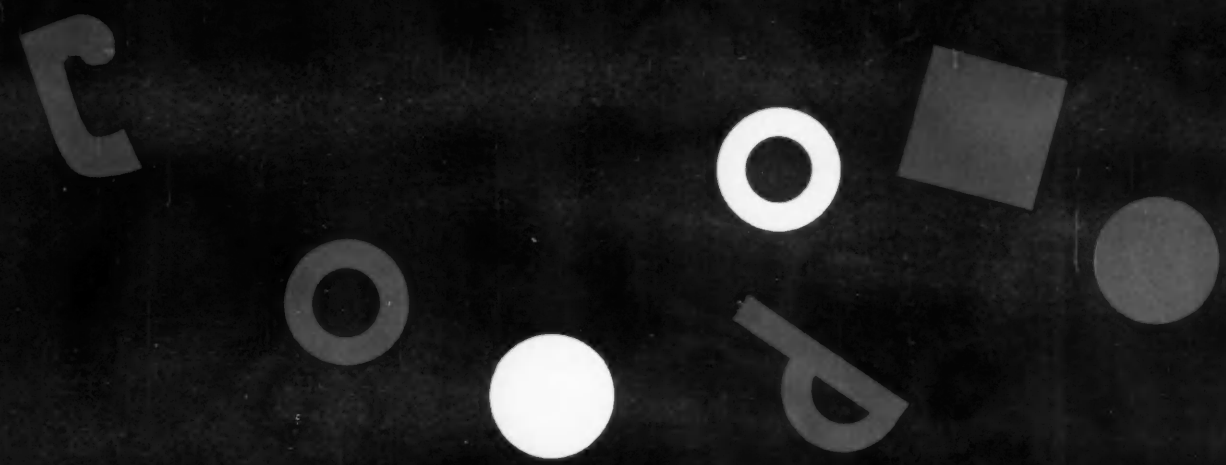
fluorosilicone rubber

is successfully solving design problems in sealing solvents, oils and fuels at temperatures from —100 to 350 F



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Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

(*Continued from page 75*)

der Allis-Chalmers engines, the H-3 a 149 cu in. power plant, the HD-3 with 175 cu in. displacement. One of the construction features of these tractors is a heavy box frame of 6 in. by 4 in. angle steel to protect the engine and power train, and to give the tractors a strong foundation for components and mounted equipment. A heavy duty wrap-around grille provides additional protection for the engine and radiator.

Independent steering clutches, and a shuttle clutch for fast reversing of direction, are other items in the handling of the tractors. Big capacity hydraulic systems, operating at 1500 psi, insure instant response to controls for attachments.

Other Trucks and Tractors

At the beginning of the Interstate Federal Highway program, a task force from American Road Builders Association drew up a statement of equipment requirements for such a construction program, based upon the best data available. It is becoming apparent that the program will be completed without requiring as much equipment as was predicted. Was the original estimate faulty?

No, says Robert P. McKendrick, executive secretary of Construction Industry Manufacturers Association, an affiliate of ARBA. A number of new conditions have come into the problem, one of which is the production by manufacturers of equipment of a size and capacity not known when the original estimate of requirements was made.

Typical of this new high-capacity machinery are Caterpillar's D-9 tractor, a 320 hp giant crawler; Clark's Michigan 480, probably the largest standard tractor in the world, with 600 hp on rubber tires; a series of huge scrapers, including Euclid's 32 cu yd TS-24, Caterpillar's 27 cu yd DW21, Allis-Chalmers' 20 cu yd model, Clark's 32 cu yd Michigan 310, and LeTourneau-Westinghouse's 28 cu yd B Tournapull; International Harvester's Payhauler 95, an off-highway truck with a capacity of 27 tons, or 18 cu yds of earth struck, and Koehring's Tribatch paver, with about 40 per cent more capacity than the prior top capacity unit.

In addition to increased size, most of this equipment has increased speed, which is often of equal or greater value in increasing work capacity. ■

Heads Aerospace Unit

Dr. H. Guyford Stever has been elected president of the Institute of Aerospace Sciences. Dr. Stever is professor of aeronautics and astronautics at Massachusetts Institute of Technology.

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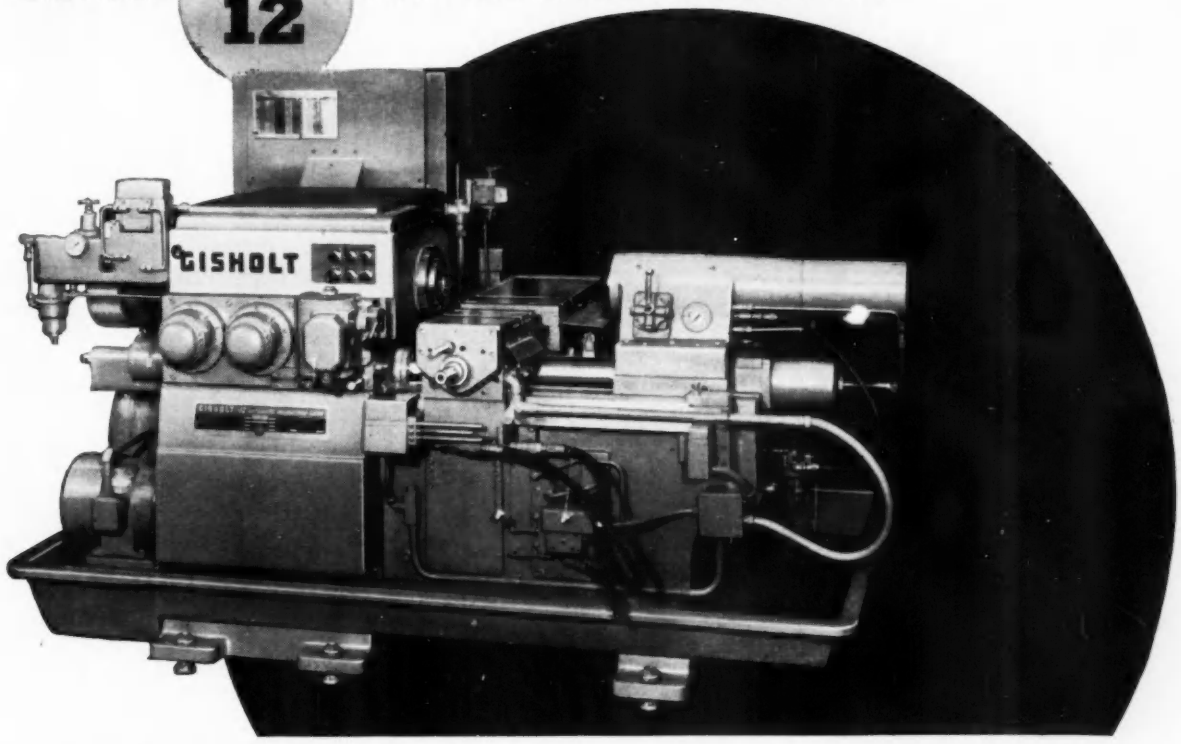
GISHOLT NUMBER 12 AUTOMATIC CHUCKING LATHE



Unequaled in its size range, in versatility, speed and low-cost production

Whether it's for continuous operation in mass production or a wide variety of parts in small lots, this machine is in a class by itself.

Faster automatic cycle. The No. 12 is a fully automatic chucking lathe, capable of performing all types of machining operations in rapid sequence. With 420 spindle speeds ranging from 40 to 2600 r.p.m. and an infinite selection of feeds, it meets every requirement for stock removal, finish and minimum f.t.f. time.

Complete range of accessories. Front, rear, auxiliary and overhead slides can be applied; angular cuts are easily made; JETracer of single- or multiple-pass types can be used. Automation can be incorporated—from simple loading and unloading to gaging and sorting of finished pieces.

Greater power and rigidity. Here, too, is the power (up to 40 h.p.) with rigidity to take full advantage of the newest tooling and the heaviest cuts without vibration.

Boosts operator productivity. It requires a minimum of operator skill and attention—allows him to handle additional machines.

With all its speed and ruggedness, the No. 12 has the extreme flexibility of motions to handle practically any machining job on parts up to 16½" in diameter. It delivers high production with consistent accuracy and less dependence than ever on operator skill.

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Ask your Gisholt Representative or write for Bulletin 1213, just off the press.

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Madison 10, Wisconsin

Investigate Gisholt's Extended Payment and Leasing Plans

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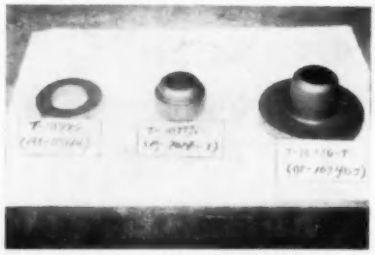
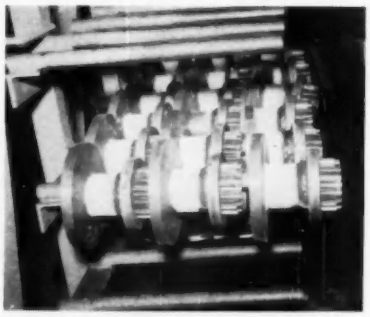
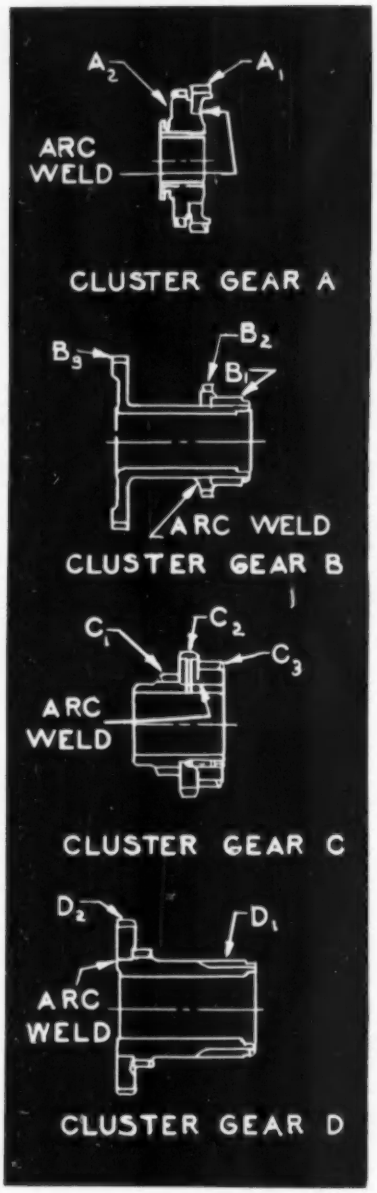
Tractor Manufacturer Adopts Welded Construction For Cluster Gears



Three forgings are the basic elements of Cluster Gear "B."



Fabricated three-element cluster ready for final machining and heat treating. Multiple pass welding procedure uses low hydrogen electrode in conjunction with pre-heat and post-heat to insure weld quality.



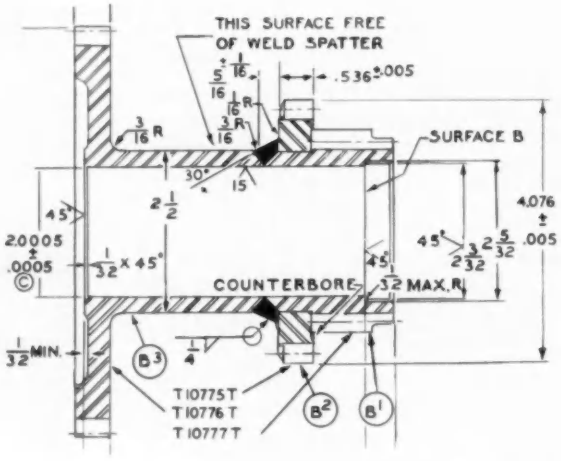
Four types of transmission cluster gears assembled from two or three basic parts by means of welding.

CHANGE in design concept of four types of tractor transmission cluster gears called for a slight reorientation of production machining sequence, but no costly retooling, at the John Deere Dubuque Tractor Works of Deere & Company at Dubuque, Iowa. Dan Mihal, project engineer, tells about it in his award-winning paper submitted in the recent Machine Design Competition of the James F. Lincoln Arc Welding Foundation, Cleveland, as follows:

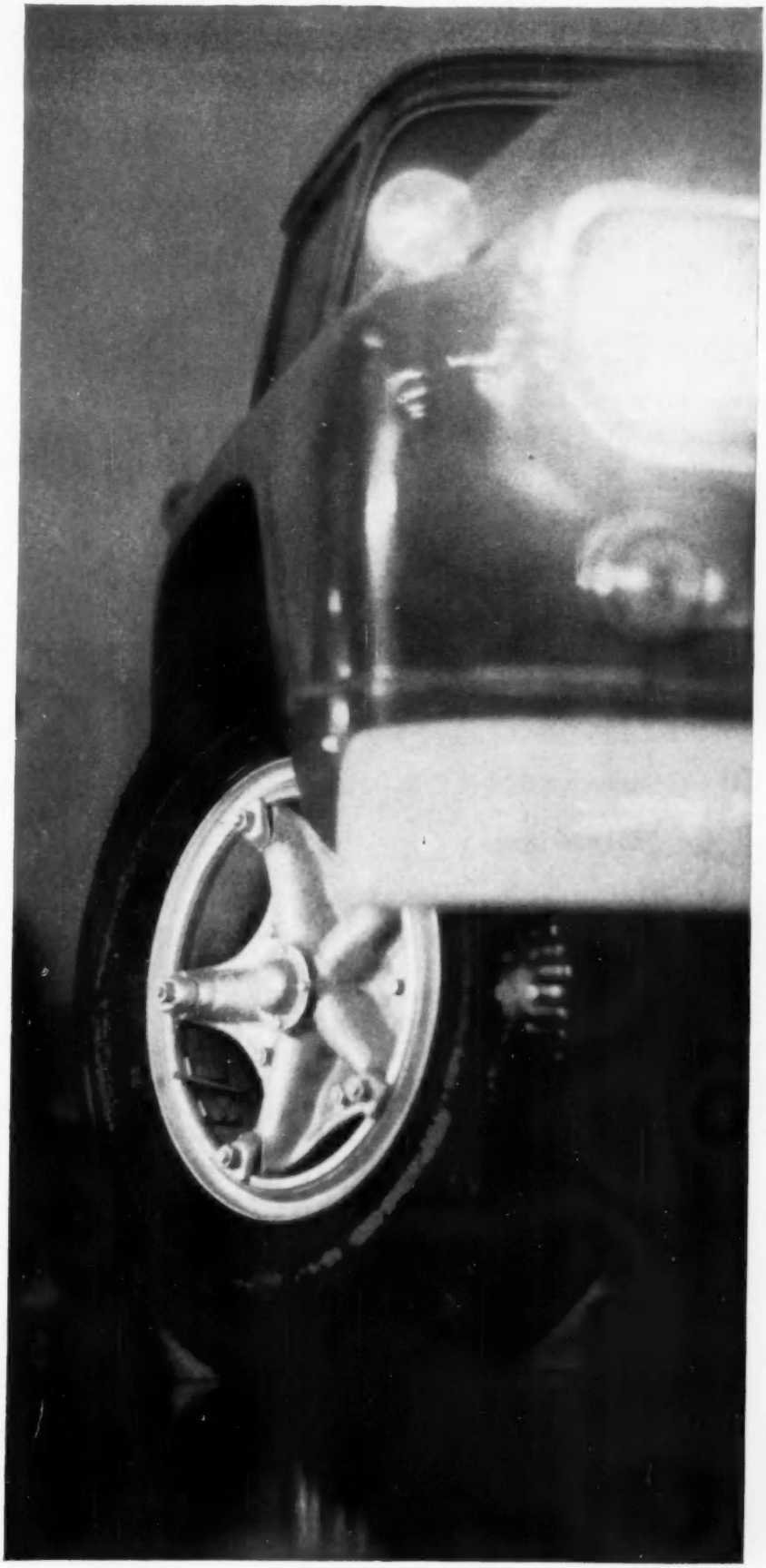
Conventional methods of machining cluster gears from single-piece forgings were discarded in favor of multi-piece construction assembled by arc welding.

Two of the gears are of two-piece construction with a single circumferential weld made in one pass in a 90-deg V-groove between mating 45-deg chamfers. Two others are of three-piece design. One has the three elements joined by a common circumferential weld made in three passes. The other uses a combination of an arc weld and silver brazing, plus the insertion of three equi-spaced dowel pins, to bond the assembly. The brazing ring is inserted in a machined groove as the mating parts are pressed together, and fuses into the joint during heat treatment. Dowel holes are positioned to lock the parts together securely and take some of the load off the brazed joint.

(*Turn to page* 125, *please*)



Section of Cluster Gear "B" showing the three component parts B_3, B_2 and B_1.



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GUNITE a producer of industry's biggest truck and trailer wheels, is now a division of Kelsey-Hayes Company. Formerly Gunite Foundries Corp., Rockford, Ill., Gunite is one of the oldest and most respected suppliers of cast steel wheels and heavy duty truck drums. Facilities and experience of this new division, combined with our own, now make it possible for us to supply industry with a complete range of truck wheels and drums. Kelsey-Hayes Company, Detroit, Michigan.

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Machining Aluminum Transmission Case Covers

(*Continued from page 71*)

SNYDER MACHINE
(*Continued*)

Station	Operation
25 RH	Drill two holes
27 RH	Drill and c'sink two holes
LH	Drill one hole
29 RH	Drill and c'sink one hole
32 RH	Drill two holes
LH	Spotface one hole
34 RH	Drill one hole
LH	Pipe tap one hole
37 RH	Drill two holes
LH	Probe one hole
39 RH	Drill two holes
43 RH	Drill one hole
44 RH	Drill one hole
47 RH	Tap two holes
48 RH	Tap one hole
49 RH	Probe three holes
50 R & LH	Wash part
52 LH	Press-in and stake plug

The part now is removed from the adapter plate, and transferred to the overhead conveyer for transport to the Heald Bore-Matic for finishing operations on both sides.

Cross Machine

Finally, we shall summarize the features and operations in the 73-station Cross transfer machine. Generally speaking, this machine turns, faces, grooves, mills, bores, drills, taps, probes, does air gaging; assembles two dowels one bushing and one plug, and stakes the plug in place.

Die castings are manually loaded into a fixture which orients the parts one at a time. The first transfer bar, serving the first 12 stations, picks up the workpiece and transports it to the first rough-turning operation. In all, three different lift-and-carry transfer bars serve the machine.

Upon reaching the first station, the part is engaged by the left-hand head which advances rapidly and automatically clamps an internal diameter with a three-jaw expanding chuck. The casting is rotated at 800 rpm while the tools are fed in.

Turning, facing, and chamfering tools are mounted on three slides, with all tools feeding to the work

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. . . 25,000 or 5,000,000 units

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A new booklet, "Designing with Dytronics Die Stamped Circuits," gives other important reasons for specifying these quality circuits and provides information that will help you design them. Write for a free copy.

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A subsidiary of Taylor Fibre Co., Norristown, Pa.

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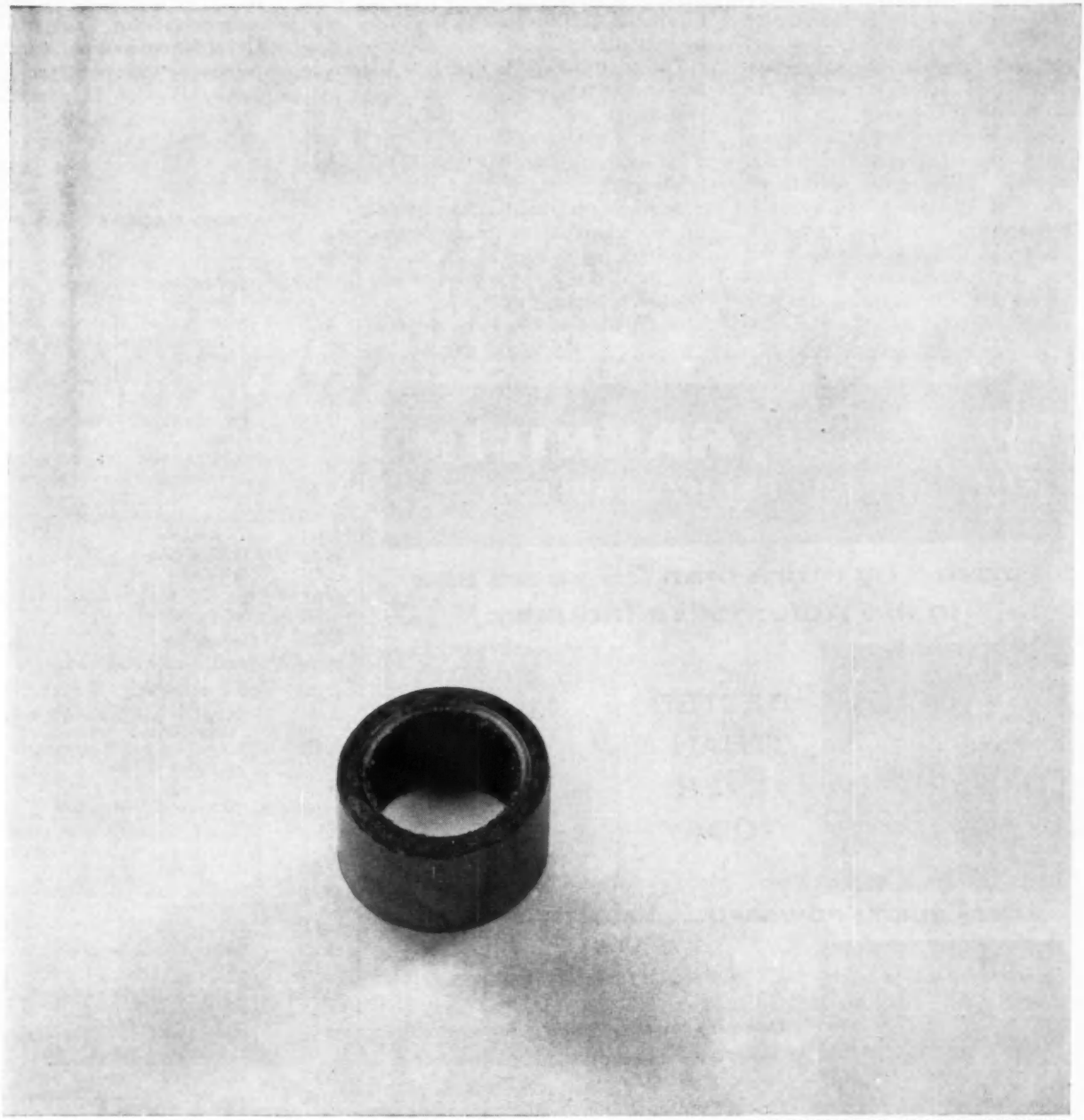

MICRO-PRECISION DIVISION, MICROMATIC HONE CORPORATION

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Loads as high as 50,000 psi don't bother this plastic bearing.

In severe high-load, low-speed tests, it came through *60 million* cycles without failure—while ordinary bearings gave up at 50,000 cycles.

What makes it so rugged?

This material is a glass-reinforced phenolic molding compound called Durez 16771. Here it surrounds the Teflon bearing surface. It acts as a keying agent to keep the bearing surface material in place under heavy loads. It also helps bond a metal shell that encloses the finished bearing.

Besides being strong and tough, Durez 16771 withstands oil, grease, and acid; can't pit, rust, or corrode. Parts made from it seldom need machining—come out of the mold ready for assembly.

What can you do with an idea-plastic like this? Automotive designers are putting it to work now in oil-pump gears, automatic transmission parts, oil-seal rings, suspension ball joints. Check into the places where a tough, high-impact plastic could do a better job than the material you're using, or could help you cut production costs. Then ask your molder for more details on Durez 16771—or write us for Bulletin D203, which describes the material and its capabilities.

DUREZ PLASTICS DIVISION

HOOKER CHEMICAL CORPORATION, 8201 WALCK RD., NORTH TONAWANDA, N. Y.

HOOKER CHEMICALS PLASTICS

with rapid advance. The center slide feeds longitudinally for boring and turning. The other two slides feed at right angles for facing and grooving.

Stations 12 to 50 handle drilling, reaming, spotfacing, counterboring, tapping, and boring operations. Many of the drills and reamers are monitored by Cross Protect-O-Tool units that will shut down the line if a tool breaks. At Station 18 the surface of the top pad is milled with a motorized spindle turning at 10,000 rpm and feeding horizontally.

The central bore in the hub is bored at Station 50, as are the two dowel holes. Covers then go through a wash and blow-off booth. Following cleaning, the hub bore is air gaged.

A single-part accumulator joins the second and third transfer bars following pressing-in of the bushing in the hub. Accumulation is necessary because two parts at a time are handled simultaneously in the remaining stations. Thus the long finish-facing cut can be taken without increasing the overall cycle of the machine.

With this summary, let us consider the actual sequence of operations in the Cross machine:

CROSS MACHINE

Station	Operation
3 RH	Semi-finish-turn face; chamfer ID, finish large groove
6 LH	Semi-finish-turn flange face large ID; chamfer and undercut and bore ID.
9 LH	Semi-finish-turn pump face and hub face
12 RH	End-cut core drill 6 holes, drill one hole
13 RH	Ream four holes, drill three holes, end-cut core drill and c'sink one hole
15 RH	Drill hole half-way through
LH	C'sink 4 holes
16 RH	Drill hole through
LH	Drill 6 holes
18 RH	Drill one hole
LH	Mill port face
19 RH	Drill one hole
21 RH	Comb. drill and c'sink one hole
22 RH	Drill one hole
24 RH	Spotface 8 holes, comb. drill and chamfer one hole, drill one hole
LH	Tap-drill one hole, comb. tap-drill and c'sink one hole
25 RH	C'sink 4 holes, drill two holes
LH	C'sink one hole, drill one hole
27 RH	End-cut core drill 6 holes, c'sink one hole
LH	Drill one hole
28 RH	Drill one, ream one, core drill two holes
LH	Drill two holes
30 RH	Drill 3 holes, ream two holes
LH	Drill two holes
31 RH	Ream two holes, c'sink three holes
LH	Drill two holes
37 RH	Tap six holes
LH	Drill one hole
38 RH	Probe 4 holes, tap one hole
40 RH	Probe 3 holes, rotate part
41 RH	End-mill one hole
LH	Drill one hole
43 RH	End-mill one hole
LH	Spotface one hole
44 LH	Comb. tap-drill and counterbore one hole
46 RH	Drill hole half-way
LH	Drill one hole
47 LH	Tap one hole
49 RH	Drill hole through
50 RH	Probe hole
LH	Finish-bore three holes
52 & 53	Wash and blow-off chips
54 R & LH	Gage
56 R & LH	Assemble seal plug and stake
57	Probe for seal plug
58 R & LH	Assemble bushing

(*Turn to page* 110, *please*)

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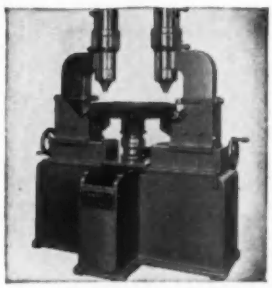

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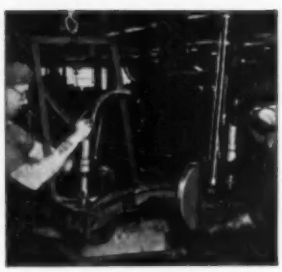

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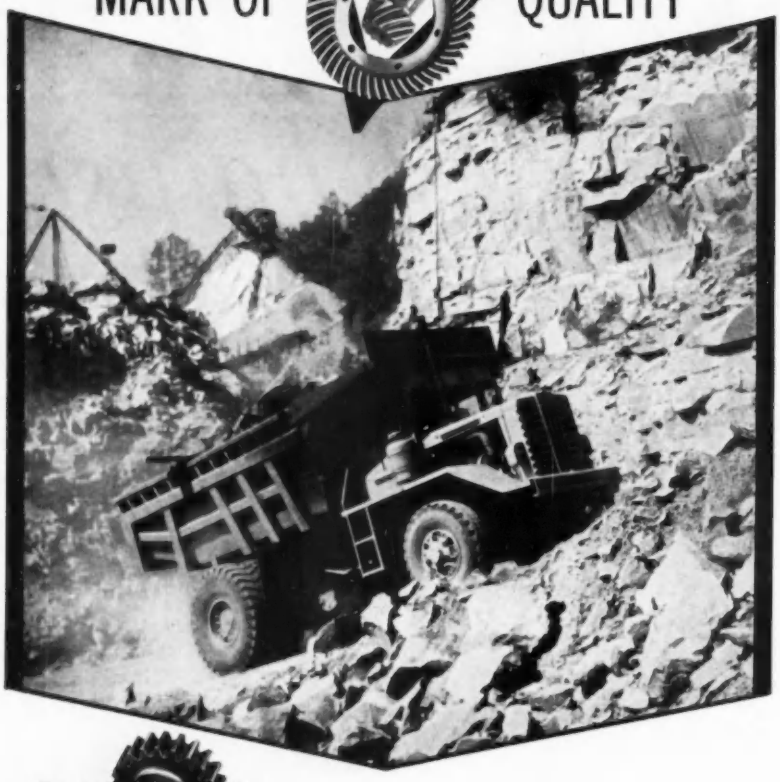

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Machining Aluminum Transmission Case Covers

(*Continued from page* 108)

CROSS MACHINE

(*Continued*)

Station	Operation
63 LH	Finish-turn flange face, hub face, pump face
64 LH	Finish-turn flange face, hub face, pump face
66 & 67 RH	Press bushing and stake
LH	Assemble two dowel pins
69 RH	Finish-turn face, neck OD, small grooves, bushing ID and chamfer
70 RH	Finish-turn face, neck OD, small grooves, bushing ID and chamfer

Comparison

These three routings provide a good comparison of processing of the different covers. Of the three transfer machines, the Cross Transfer-Matic is the only one that is tooled to complete the part in every detail, primarily because of the design of the particular die casting.

It is significant that each of the transfer machines represents the latest thinking in the art. As noted, the equipment has detectors to warn against broken drills or taps; probes for checking drilled holes before tapping; and gaging stations. The design of each machine is further complicated by the introduction of two assembly stations —one for a bushing, the other for a plug. ■

Republic Tool Expansion

Republic Aviation Corp. has scheduled a $3 million expansion of its battery of tape-controlled automatic machine tools.

Ten additional tape-operated machines will be added to the production line building the automatic, all-weather F-105D fighter-bomber.

Three of the new machines are capable of drilling, boring or milling as well as changing tools and positioning the work part—all automatically. They will handle the machining on smaller wing and fuselage parts. The remaining seven units are larger "profiling" milling-type machines designed to cut such large airframe parts as the wing skin, spar caps and other main fuselage sections.

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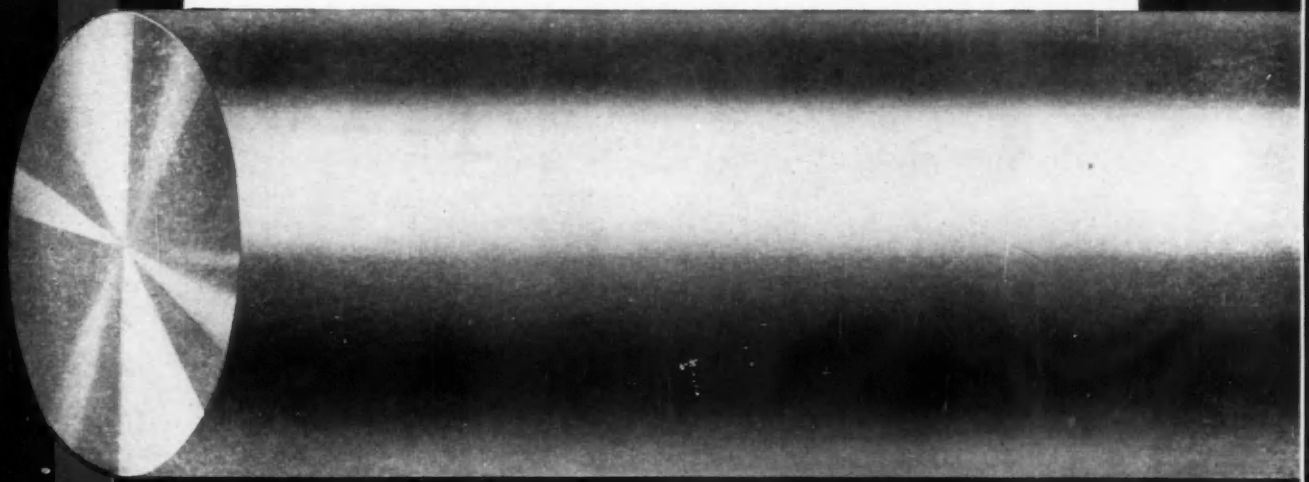

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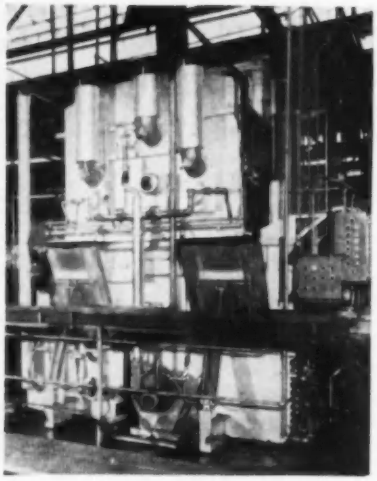

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1961 Marine Engines

(*Continued from page* 92)

Kiekhaefer Corp.

Mercury outboards for 1961 cover the power range of from 6 to 80 hp in nine different models, same as last year. But there has been a realignment of two of the models, and the 6-hp unit is new.

New horsepower categories are the 40-cu-in. Merc 350, rated 40 hp, and the 44-cu-in. Merc 500, rated 50 hp. The prior four-cylinder 35-hp and six-cylinder 60-hp series have been discontinued for '61, so that the intermediate model lineup is now 22-40-45-50-70 versus last year's 22-35-45-60-70 hp.

The 6-hp, 7.2-cu-in. Merc 60 is a new fishing motor. It has full gearshift, safety drive clutch, and provision for remote operation, as well as underwater exhaust through the propeller hub.

All Mercury models have cylinders in line, and come in two, four, or six cylinders. The four two-cylinder motors have ratings of 6, 9.8, 15, and 22 hp in displacements of 7.2, 18.5, 18.5, and 22 cu in. The three four-cylinder models are rated 40, 45 and 50 hp, and have displacements of 40, 44, 44 cu in., respectively. The 70-hp Merc 700, of six cylinders, has a displacement of 66 cu in. Biggest Mercury motor is the Merc 800, rated 80 hp, with six cylinders having a bore and stroke of 2¾ x 2⅛ in. displacing 76 cu in.

Electric starting is available on all five models from 40 hp up. An alternator is standard on the 70 and 80-hp models, and optional on the 40 to 50-hp models. The six-cylinder Merc 700 and 800 have battery ignition; and are obtainable in either direct-reversing or full-gearshift types.

All '61 Mercury motors have single-lever control, safety drive clutch, and fixed-jet carburetors (one for every two cylinders).

McCulloch Corp.

The Scott line of outboards for '61 consists of six motors having the same piston displacements as last year's models, but the power ratings of four of them have been

(*Turn to page* 116, *please*)

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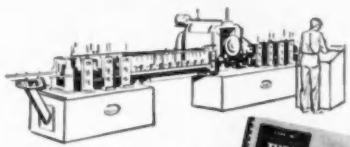

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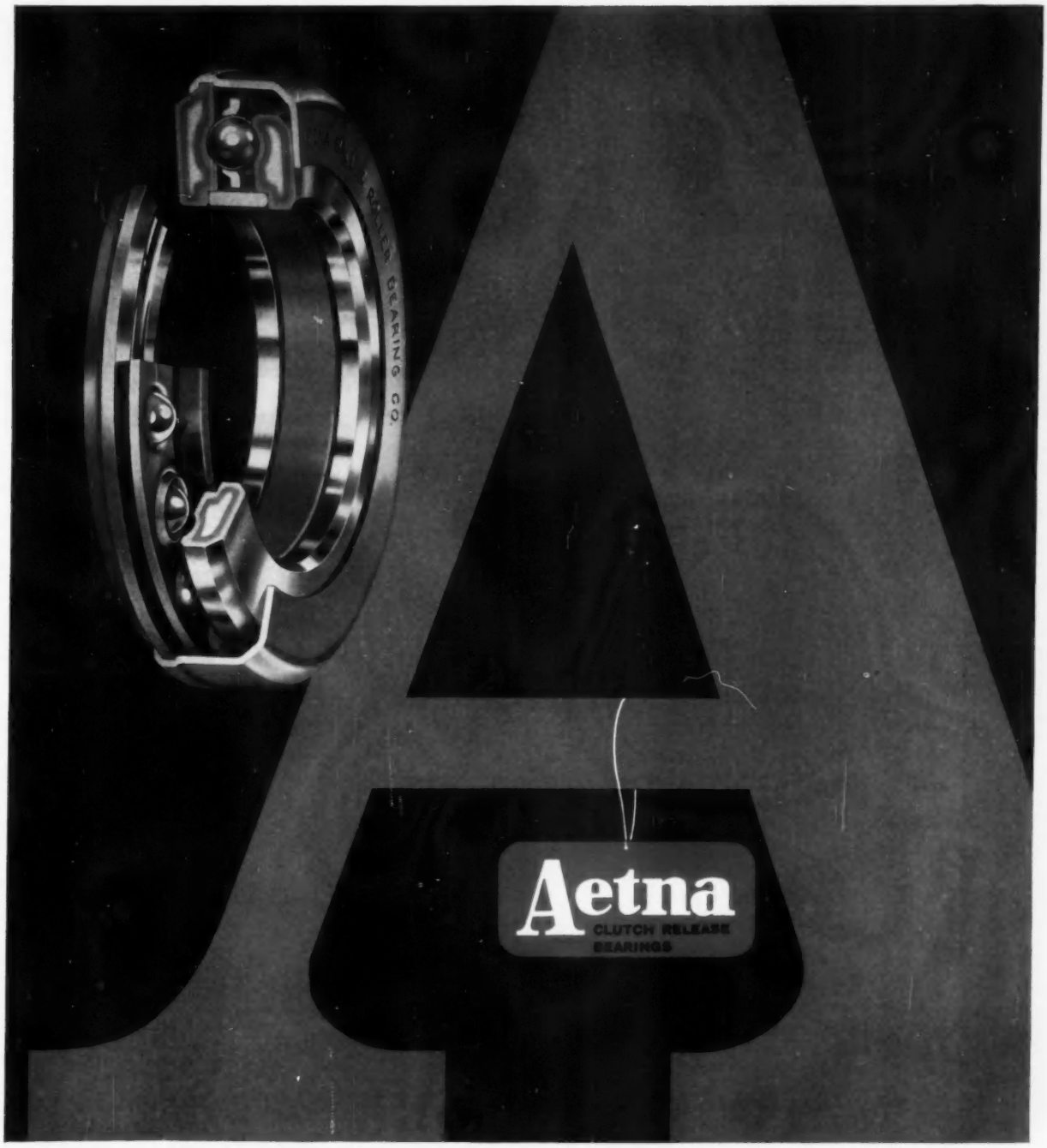

LISTEN . . . THEY'RE SO QUIET Put an Aetna bearing to the noise test and listen. Aetna bearings are quiet. They run smoothly and silently on and on without a trace of crackling or whine. This is because Aetna bearings are sound tested under prescribed load to uncover all traces of dirt, chatter, groove wobble, tight cage, and other imperfections. Sound testing is an important part of our quality control. And it assures you of consistently dependable bearing performance for your applications. For information on the complete line of Aetna ball and roller bearings, call your Aetna representative listed in your classified directory or write for General Catalog and Engineering Manual.

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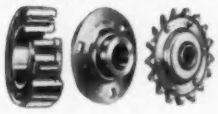

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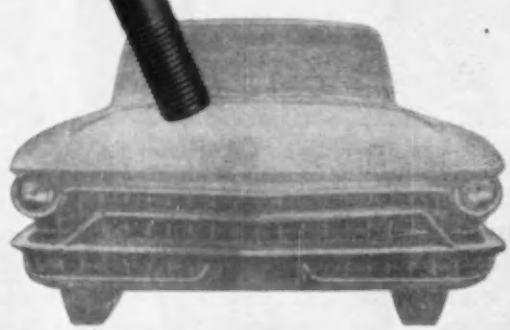

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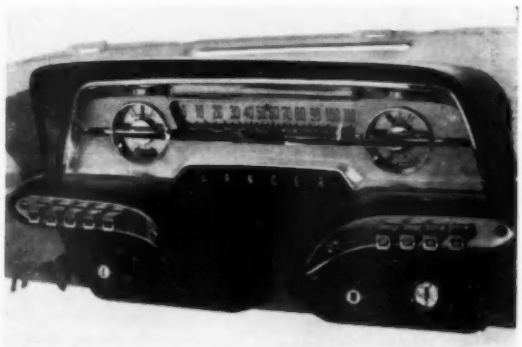
Manufacturers' News

New Goodrich Department

Establishment of a department of product design, styling and packaging to serve all divisions of the B. F. Goodrich Co. has been announced by Don C. Miller, vice president-marketing. James D. Floria has been appointed director of design. He will co-ordinate various existing Goodrich services in developing product and packaging designs for a wide range of rubber and plastic products.

Chemetron Acquires Chemical Firm

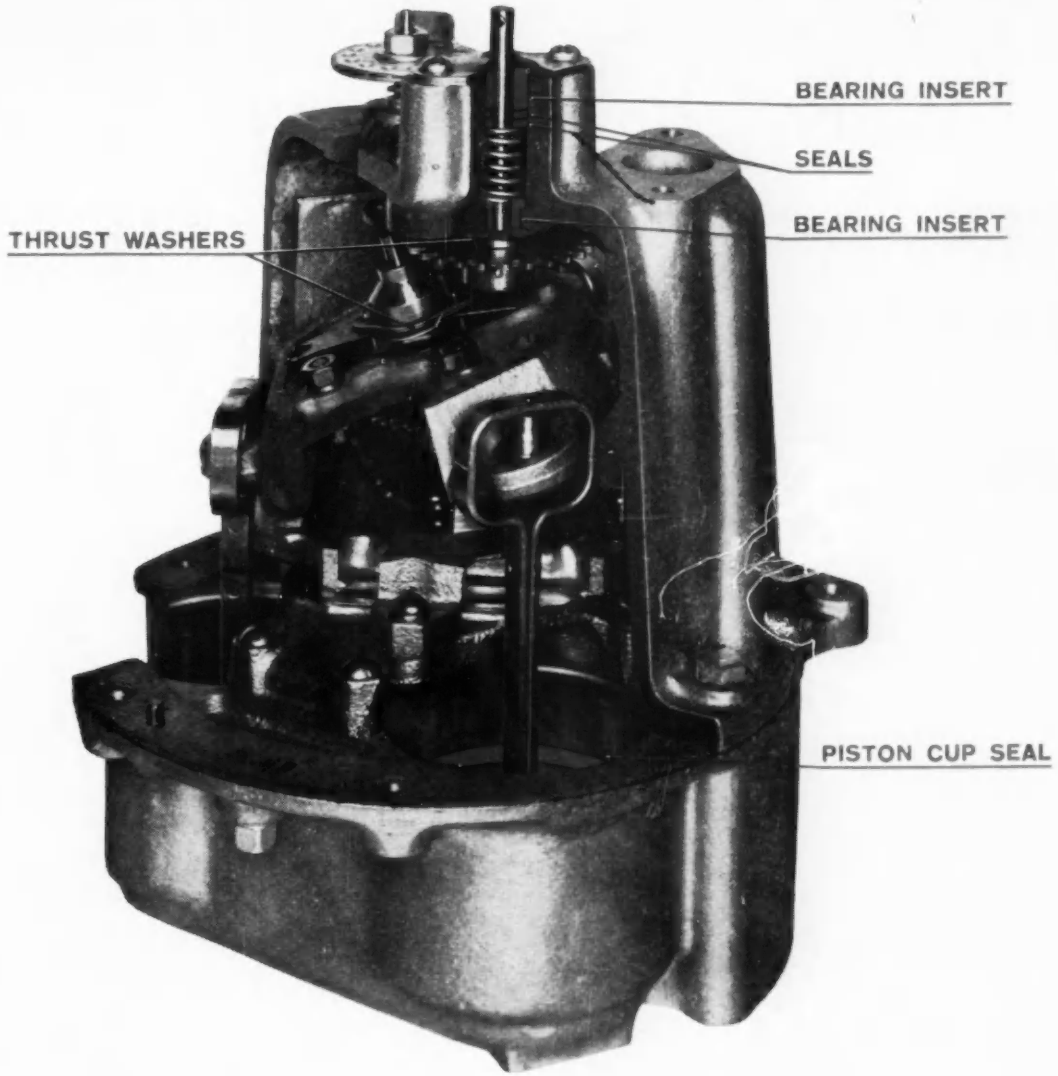
Chemetron Corp., of Chicago, has acquired Northwest Chemical Co., of Detroit, manufacturer of chemicals widely used in the metalworking industry. Northwest Chemical's products include metal cleaners of immersion, electrolytic and spray types; acid addition agents; phosphate coatings; paint strippers, and other chemicals and compounds for conditioning ferrous and nonferrous metals before plating, etching, welding, anodizing, priming, enameling or painting.



Magnesium surrounds dials and provides mounting for heater and automatic transmission buttons on the Lancer, Chrysler's new compact. The part consists of two die castings and weighs only 3¼ lb.

Phoenix Steel Buys Plant

Phoenix Steel Corp. has purchased the Claymont, Del., plant of Colorado Fuel & Iron Corp. The plant, which has a rated annual ingot capacity of 506,500 tons, will increase Phoenix Steel's annual capacity to 1,353,260 tons. Colorado Fuel & Iron acquired the Claymont plant in 1951 from Worth Steel Co. for $14 million. J. A. Sisto, Phoenix chairman, said the Claymont plant will be operated in conjunction with Phoenix Steel's blast furnace at Chester, Pa., three miles north of Claymont. There are no blast furnaces at Claymont.



Non-lubricated seals and bearings made with TEFLON® give maintenance-free service in gasoline pump meter

This new pump meter is built for maximum reliability—designed to withstand the effects of additives in gasolines. The drive rod seals, piston cup seals, sleeve bearings and thrust washers are made with filled compositions of TEFLON fluorocarbon resins. TEFLON was specified for these vital parts because it has the lowest coefficient of friction of any solid and it is chemically inert.

The zero-leak seals made with TEFLON require no lubrication. They are unaffected by corrosives... will not age or harden... do not require any maintenance. The bearings have the necessary frictional and wear characteristics to offer similar maintenance-free performance.

The simplicity and dependability of seals and bearings made of TEFLON resins open a wide variety of opportunities in automotive design applications. It will pay you to investigate the functional improvements and cost savings made possible with TEFLON.

For more information, write: E. I. du Pont de Nemours & Co. (Inc.), Dept. AI-115, Room 2526T, Nemours Bldg., Wilmington 98, Delaware.

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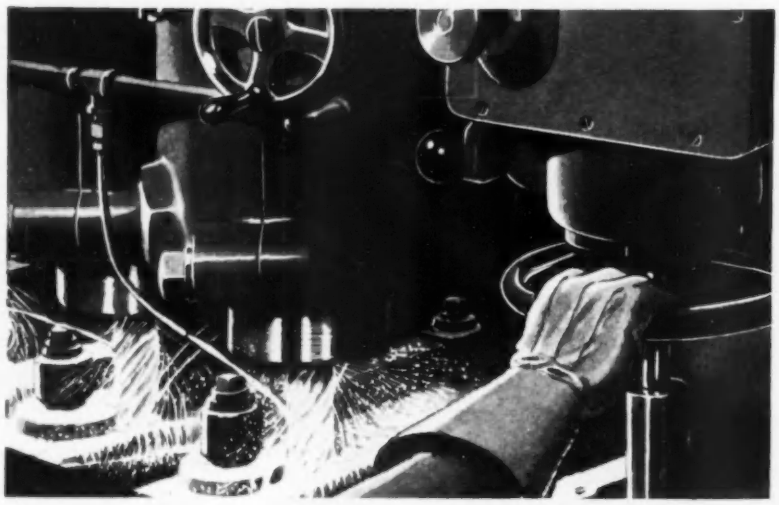

Oakite Formula 59 cutting solution fights rancidity . . . lasts longer

Most soluble oil cutting solutions are thrown out before they're worn out. When they turn so rancid that operators can't stand the smell, they're replaced. Understandable . . . and wasteful. But using Oakite 59 is far more economical. It *resists* rancidity, lasts far longer—especially in summer, helps protect workers from infection, cuts cost.

How well does it lubricate? Specially formulated from paraffin crude, it forms a stable, uniform emulsion in water for excellent lubrication, good cooling, corrosion protection for work and machine alike.

One of a line of Oakite lubricants for machining and forming, Oakite Formula 59 is a specialized material—as all Oakite products are. Ask the Oakite man about those designed for your operations, your products. And send for Bulletin A-9864. Oakite Products, Inc., 34E Rector Street, New York 6, N. Y.

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OAKITE

SCIENCE

over 50 *Est. 1909*

years' leadership in industrial cleaning

1961 Marine Engines

(*Continued from page* 112)

boosted. Top rating is now 75.2 hp versus 1960's 60 hp.

Largest motor in the line is the Flying Scott, a three-cylinder unit with a bore of 3⅛ in. and a stroke of 2¾ in. Total piston displacement is 63.27 cu in.; and weight only 168 lb. It is rated 75.2 hp at 5200 rpm—an increase of 15.2 hp over last year's 60 hp. A separate carburetor, making a total of three, is used for each cylinder. McCulloch says the power boost was accomplished by an increase in compression ratio from 5.9 to 6.5 to 1, a redesigned intake transfer plate that provides smoother fuel flow to cylinders, a new piston baffle that has improved combustion characteristics inside the cylinder, and by recalibrated carburetors.

The Royal Scott, next in size, is a two-cylinder motor with a piston displacement of 42.18 cu in., rated 43.7 hp at 5000 rpm (up 3.7 hp). This unit likewise has a carburetor for each cylinder. The electric model weighs 142 lb.

The Sport Scott is a two-cylinder of 29.97-cu-in. displacement, rated 27.7 hp at 4800 rpm (up 2.7 hp). Weight is 109 lb with electric starting.

The Flying, Royal, and Sport Scotts have "Aqua-blade" lower units which are designed for low drag resistance and which include a two-degree offset to improve steering by counteracting propeller torque. All three come in electric-starting models with a 12-amp alternator built in the flywheel and battery - type ignition. Manual-starting units also are available in the Royal and Sport Scott models, and employ magneto ignition. Fixed-jet carburetors are now used on all three.

The Fleet Scott, weighing 68 lb and having a piston displacement of 16.4 cu in., is rated 14.1 hp at 5000 rpm (up 2.1 hp).

The other models are the two-cylinder Fishing Scott rated 7.5 hp at 4500 rpm, and the single-cylinder Scotty rated 3.6 hp at 4000 rpm. Weights are respectively 39 and 36 lb.

(*Turn to page* 120, *please*)

Circle 165 on Inquiry Card for more data

BLOOD BROTHERS UNIVERSAL JOINT

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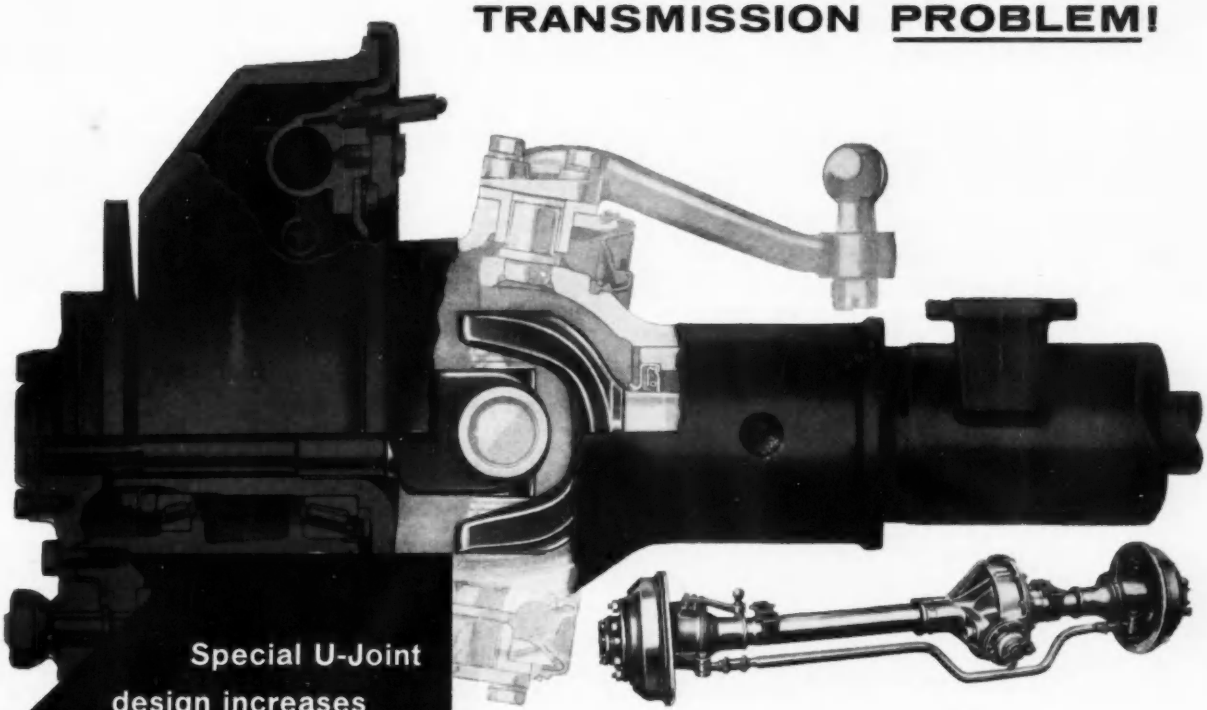


Special U-Joint design increases axle torque capacity... yet lowers axle production costs!

Working with a major manufacturer of truck axles, Rockwell-Standard engineers developed a new design for a front steering, driving axle that uses a single carden universal joint in place of the expensive and complicated constant velocity type previously used on a special all-wheel-drive vehicle.

The result: *An axle that provides substantially increased torque capacity . . . at a considerable savings in manufacturing costs!*

Whether you are designing a new product or seeking to improve an existing one, consult Rockwell-Standard engineers for specialized help in meeting your universal joint needs. Chances are, a Blood Brothers product will not only increase performance – but save you time and money as well.

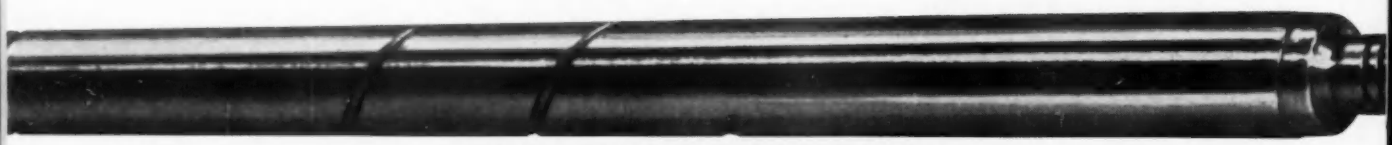
For further product information write for Bulletin

Another Product of...

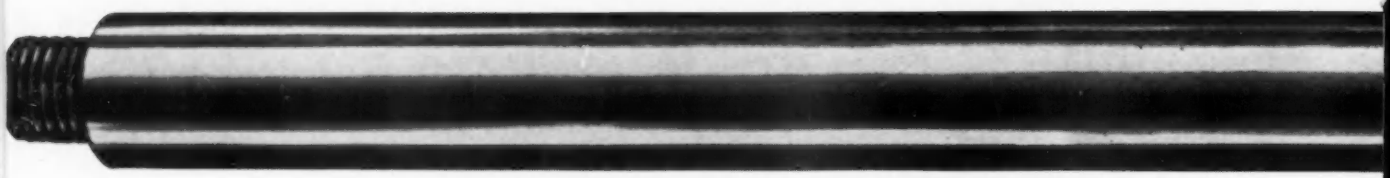
ROCKWELL-STANDARD CORPORATION

Universal Joint Division, Allegan, Michigan

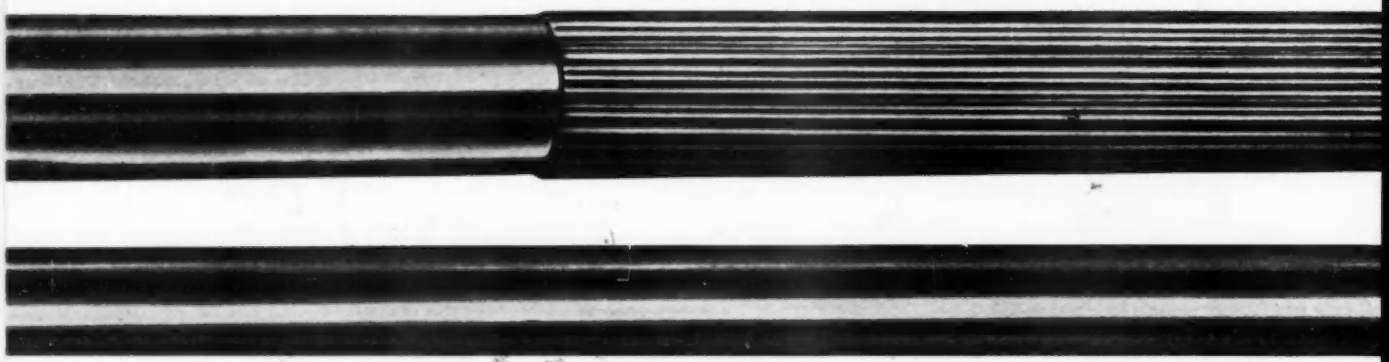
Circle 166 on Inquiry Card for more data



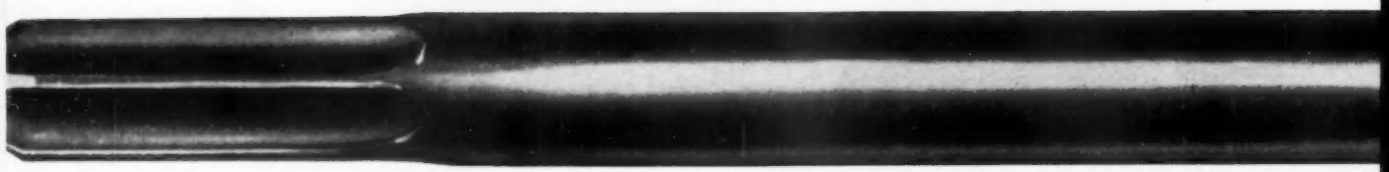
CENTURY SERIES C-1144 for highly machined parts.



CENTURY SERIES C-1141 and C-1151 for moderately machined parts.



CENTURY SERIES C-1050 and C-1045 for parts where machinability is a minor factor.



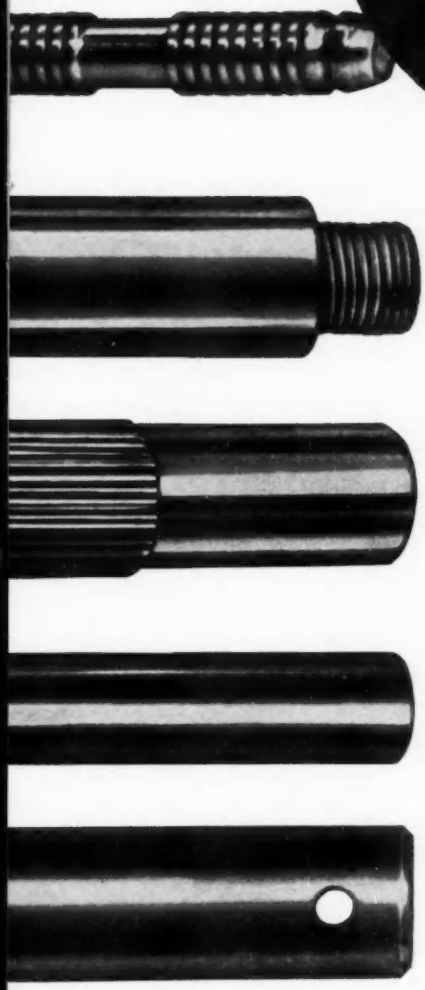
WRENCH SOCKETS, made by Herbrand Division of The Bingham-Herbrand Corporation, Fremont, Ohio, illustrate the kind of application where the superior strength, toughness, and machinability of *Republic Cold Finished Alloy Bars* help produce a better product at lower cost.

Bars are formed, drilled, and cut off in an automatic screw machine, then hot broached to shape internal dimensions. Final stages of socket production include heat treat and chrome plating. Mail coupon for more data on Republic Alloy Bars.

ROTOR BUCKETS for Mechanical Drive Turbines manufactured by Elliot Co., Jeanette, Pa., are produced from *Republic Stainless Steel Special Sections* . . . an excellent example of how Republic Special Sections save money on tough-to-make parts.

User benefits include: simplified machining, corrosion and abrasion resistance, greater strength and hardness, smooth surfaces that reduce or eliminate finishing operations. Available in a wide range of sizes and contours . . . carbon, alloy, stainless steel, and titanium. Send coupon.

Cut Material Costs on High Strength Parts



Republic CENTURY 100 SERIES Cold Finished Bars

LET YOU CHOOSE FROM 5 GRADES, 5 DEGREES OF MACHINABILITY, 5 PRICE LEVELS

With Republic's CENTURY SERIES of high strength, stress-relieved, cold finished steel bars, you pay only for the machinability you need to meet your production requirements. CENTURY SERIES bars are priced on a descending scale (as machinability decreases, price drops). This makes it possible for you to realize important savings by selecting lower-sulphur-content, high-strength-toughness-ratio bars for applications where machinability is not of prime importance. Each of the five grades has a minimum yield strength of 100,000 psi.

PRODUCTION FACILITIES for CENTURY SERIES bars are strategically located in key metalworking markets to serve you better. Result: faster deliveries, and expert metallurgical service, *when you need it,* on the complete line of Republic Cold Finished Steel Bars. For more information on CENTURY SERIES bars and Republic Metallurgical Services, send the attached coupon.

This STEELMARK of the American Steel Industry tells you a product is made of Steel. Look for it when you buy. Place it on the products you sell.

Steel

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

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REPUBLIC STEEL CORPORATION
DEPT. AI -1565
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Send more information on:

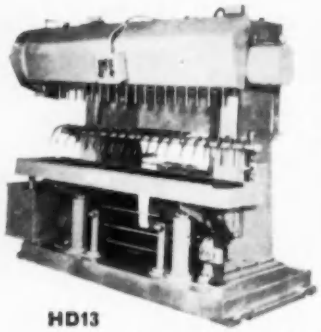
- ☐ CENTURY SERIES
- ☐ American Steel Industry STEELMARKS
- ☐ Cold Drawn Special Sections
- ☐ Cold Finished Alloy Steel

Name_____ Title_____

Company_____

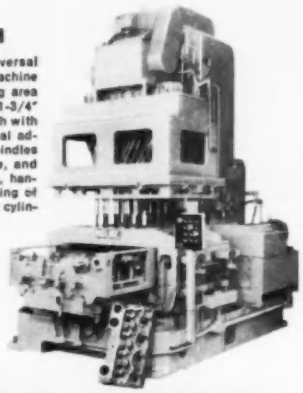
Address_____

City_____ Zone____ State_____



MODEL HU111

Hydraulic Feed, Universal Joint-Type Drilling Machine with 24" x 50" drilling area and with forty-two 1-3/4" spindle drivers, each with two-speed and neutral adjustment. Thirty-six spindles in slip spindle plate, and power shifting fixture, handle drilling and reaming of three different engine cylinder heads.



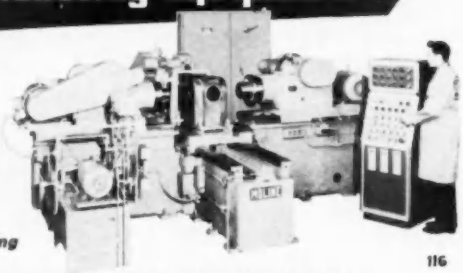
HD13

straight line drilling machine with hydraulic table feed and 18 spindles each having 11/16" diameter drill capacity in mild steel. Spindle center distances are adjustable along the 6-foot machine rail.

MOLINE Cost Reducing Equipment

MODEL MR148

Three-way, three-spindle, horizontal boring machine with selective automatic feed cycle. Handles boring of cylinder and crank bore for 3 sizes of 1-cylinder blocks. Also bores for wet sleeves in 2- and 3-cylinder blocks.



60 years of Machine Tool Engineering Experience is at your service for

116

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Special Multiple Operation Machine Tools

Write for Details

MOLINE TOOL CO.

MOLINE TOOL COMPANY
100 20TH STREET • MOLINE, ILLINOIS

REPRESENTATIVES IN PRINCIPAL CITIES

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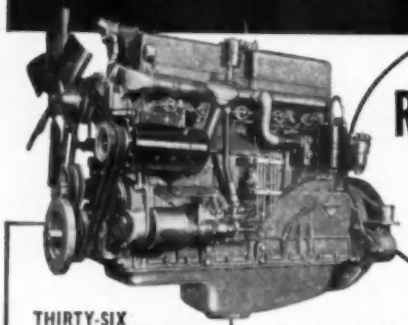
CONTINENTAL RED SEAL POWER



FOR RUGGED STAMINA ECONOMY LONG LIFE

THIRTY-SIX TRANSPORTATION ENGINES ARE AVAILABLE

•

Thirty-one gasoline models, from 26 to 300 horsepower—five Diesel models, from 66 to 225 horsepower.

For nearly 60 years, Continental Red Seal transportation engines have found wide acceptance in the really tough jobs where extra stamina is a prime consideration—in heavy-duty highway trucks and tractors, both as original equipment and as replacements for other makes, in buses, taxicabs, door-to-door delivery vehicles, transport mixers and the like.

•

CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD

Continental Motors Corporation

MUSKEGON • MICHIGAN

Circle 169 on Inquiry Card for more data

1961 Marine Engines

(*Continued from page* 116)

West Bend Aluminum Co.

New in the West Bend line of outboards for 1961 is the Tiger Shark "800," with a rating of 80 hp at 4750 rpm. It ups the top power offering of this builder from last year's 40 hp.

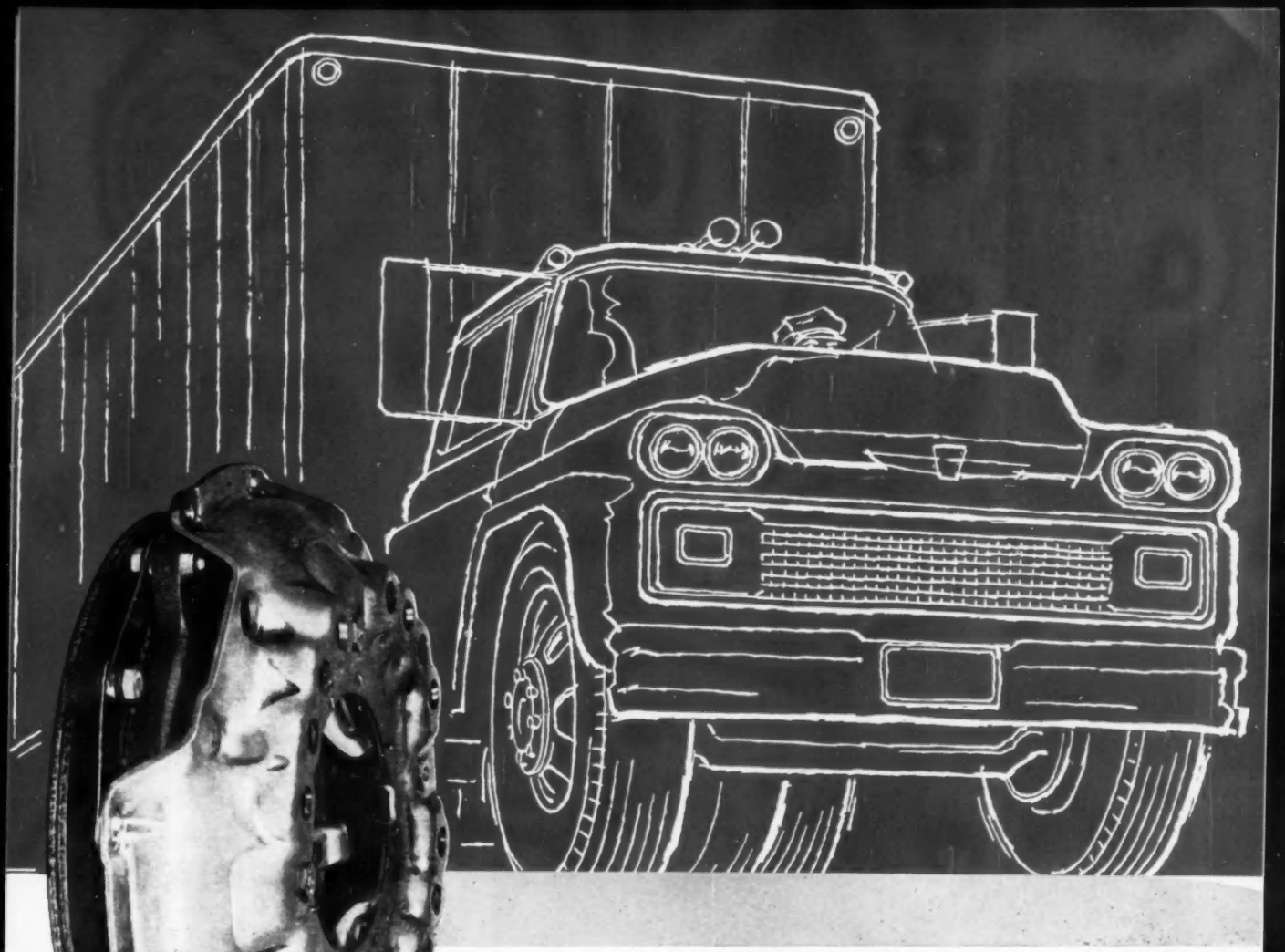
The Tiger Shark "800" is a four-cylinder-in-line motor with a bore of 3⅛ in. and a stroke of 2¾ in. Total piston displacement is 84.36 cu in. Weighing 212 lb, it is electric-starting. Battery charging is provided by a 12-v, 20-amp alternator equipped with selenium rectifier and voltage regulator. The battery ignition system has a separate coil, condenser, and breaker point set for each spark plug. Two twin carburetors, with fixed high-speed jets, are used. This motor also is equipped with twin hydraulic shock absorbers to minimize kick-up when striking an underwater object. A cut-off switch momentarily shuts off the ignition to prevent over-speeding under such conditions. Cooling is thermostatically controlled.

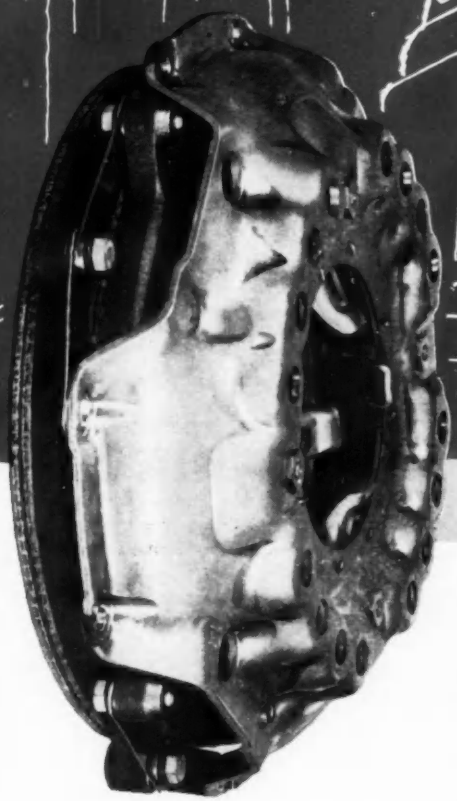
The Golden Shark 40, next in the line, is a two-cylinder motor of 42.18-cu-in. displacement, rated 40 hp at 4750 rpm. It is available in three versions: a manual rewind starter, an electric starter, and a deluxe model with electric starting and 25-amp alternator-generator. The latter weighs 137 lb, and is equipped with dual battery ignition; while the manual-starting model weighs 114 lb and has magneto ignition. Major new feature of the Golden Shark line is the "Torpedo" lower unit, reduced 24 per cent in area and streamlined for lowering underwater drag.

In the West Bend Silver Shark line are 25, 18, and 12-hp models, of two cylinders each. The 25 is an electric-starting unit with a piston displacement of 37.71 cu in., and weighs 123 lb. The 18-hp weighs 64 lb, and the 12 hp weighs 59 lb.

Other models in the line are the 7½-hp two-cylinder Special, weighing 47 lb, and the single-cylinder 28-lb aircooled Shrimp of 2 hp. ■

Circle 170 on Inquiry Card for more data →





New BORG & BECK 2-Plate "Strap-Drive" Clutches

PACK MORE MUSCLE...WITHOUT ADDED SIZE

Trucks pay out on the road, not in the shop. So it's asking for trouble when a truck engine is too big for its clutch.

To help keep 'em rolling, Borg & Beck has developed a new line of 2-plate clutches with up to 40% greater load capacity . . . yet without any increase in nominal size.

Rated at 500 ft.-lbs. torque capacity, this new Borg & Beck Type 13E2 has 12⅞" O.D. x 7¼" I.D. facings . . . non-cushion rigid or flexible center drive plate . . . space for 16 heat treated coil springs of total load to suit type of service . . . "strap drive" for positive, trouble-free plate separation.

And like all Borg & Beck clutches, Type 13E2 is built to Borg & Beck's pace-setting standards for quality, performance and value. Consult our engineers for details.

BORG & BECK CLUTCH — THE STANDARD

Reg. U.S. Pat. Off.

BORG & BECK
B-W
DIVISION
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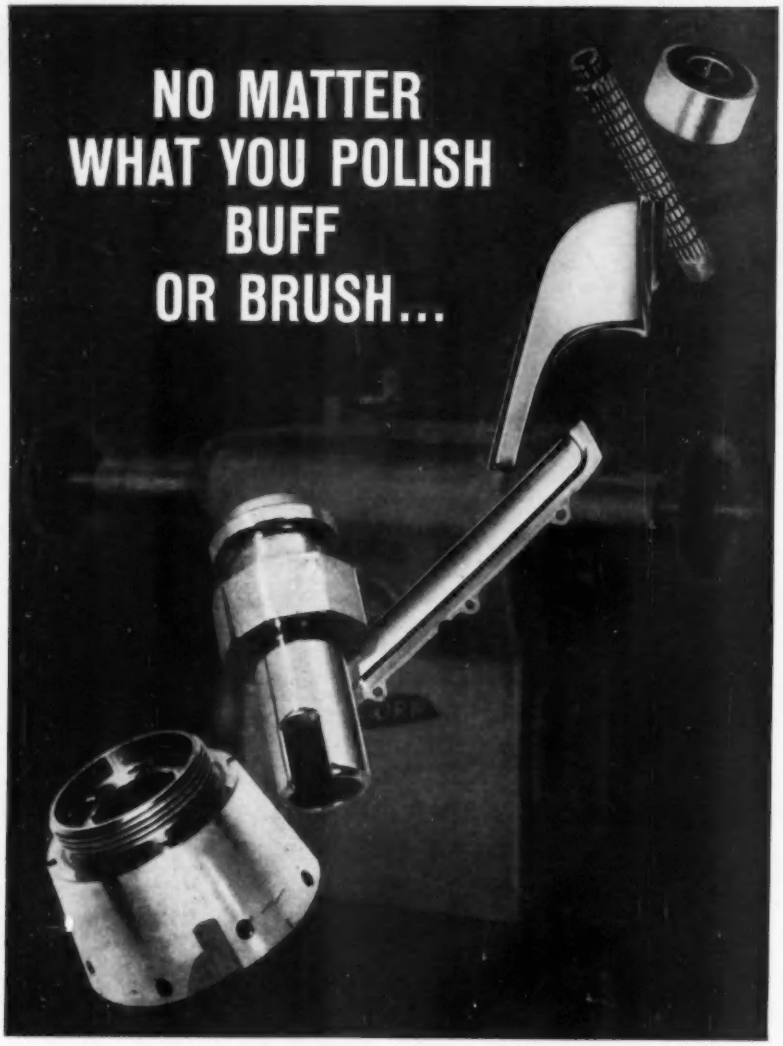
BORG & BECK®

THE AUTOMOTIVE STANDARD FOR MORE THAN 40 YEARS

BORG & BECK DIVISION, BORG-WARNER CORPORATION, CHICAGO 38, ILLINOIS

Export Sales: Borg-Warner International, 36 S. Wabash, Chicago 3



NEW OSBORN POLISHING/BUFFING LATHES . . . these compact, variable speed lathes are Osborn-engineered to handle your work economically at highest efficiency. Available with balanced single or double spindles, fixed or variable speed ranges from 600 to 3600 rpm. Variable speed lathes have 3-to-1 speed range. Choice of 3, 5 or 7½ hp motors. Other features include: motor-mounted magnetic disc brakes for instantaneous spindle stopping. Roto-Cone drive for instant, vibration-free power transmission and speed changes.

FREE BULLETIN 620 includes complete specifications, operating and construction details plus application data. For your copy, write or call *The Osborn Manufacturing Company, Dept. E-94, Cleveland 14, Ohio. Phone ENdicott 1-1900.*

Metal Finishing Machines
. . . and Finishing Methods
Industrial Brushes
Foundry Production Machinery

OSBORN

Circle 171 on Inquiry Card for more data

Missile Trailers

Additional orders for more than $2 million worth of overland Atlas missile trailers have been awarded to Goodyear Aircraft Corp.'s Arizona Div. by Convair (Astronautics), Div. of General Dynamics Corp.

Bases are being rushed to completion in various parts of the country in the stepped-up Atlas missile program, resulting in the need for additional transporters, GAC-Arizona officials stated.

The Atlas trailers, along with other ground support equipment, have been manufactured at the Arizona Div. since the inception of the Atlas program in 1955. Convair-Astronautics is the principal contractor.

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. Typical of the items contained in these monthly listings are: passenger cars, motor trucks, aircraft, military tanks, engines, transmissions, other components, spare parts, plant equipment, etc. This list is for the period Nov. 22 to Jan. 4, inclusive.

CARLISLE CORP., Carlisle, Pa.
Aircraft tubes, 2,000 ea.—$64,300

CATERPILLAR TRACTOR CO., Peoria, Ill.
Caterpillar Tractor, 1 ea.—$22,148

CHRYSLER MOTORS CORP., Washington, D. C.
Mail Delivery trucks, 1000 ea.—$2,354,315

CHRYSLER MOTORS CORP., Washington, D. C.
Sedans and station wagons, 34 ea.—$69,036

CHRYSLER MOTORS CORP., Washington, D. C.
Various trucks, 39 ea.—$108,282

CONSOLIDATED DIESEL ELECTRIC CO., Stamford, Conn.
Tractor, Wheeled, 122 ea.—$3,533,800

CONTINENTAL MOTORS CORP., Muskegon, Mich.
Engine, gasoline, 6 cylinders, 40 ea.—$203,578

FIRESTONE TIRE AND RUBBER CO., Akron, Ohio
Wheel, Solid Rubber Tire, 4,297 ea.—$29,692

(*Turn to page* 124, *please*)

LET OUR QUALIFIED SALES ENGINEERS HELP YOU SOLVE YOUR FUEL TANK PROBLEMS.

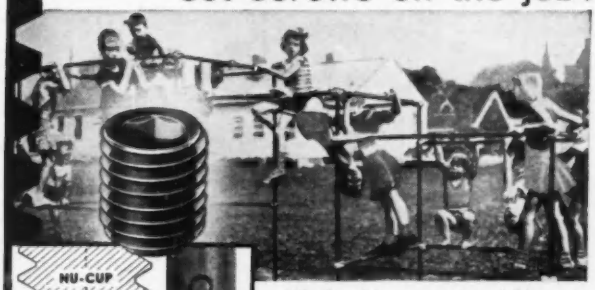
ALWAYS SPECIFY SNYDER

Snyder Tank CORPORATION

P.O. BOX 14, BUFFALO 5, NEW YORK

Circle 172 on Inquiry Card for more data

they're safe with SETKO NU-CUP* set screws on the job!



Whether it's supporting children on monkey bars or harnessing a spinning shaft you'll find NU-CUP set screws dig in deeper and hold tighter. The shaft illustrated here tells the story.

NU-CUP has a 42% sharper point which penetrates in a deep, full circle giving tremendous holding power. In some cases it actually reduces the number of set screws needed for the job. You can get them in slabbed, slotted, hex or fluted socket.

SEND FOR FREE TEST SAMPLES and full information. Ask about NU-CUP set screws. Catalog 23 free, on request.

*U S Pat No 2,778,265

SETKO Set Screw & Mfg. Co. 16 Main St. Bartlett, Ill. 574

Circle 174 on Inquiry Card for more data

Thousands of users know FITZGERALD Fused-Aluminum Steel and Asbestos GASKETS end costly gasket failures

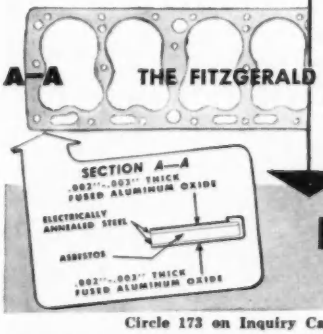
Specially designed, ruggedly built, to give a lasting, perfect seal in high compression engines, gasoline or diesel.

There's a Fitzgerald Gasket for Every Engine

Grease Retainers

Cork Gaskets

FITZ-Rite Treated Fiber Gaskets for oil, gasoline and water connections



A—A THE FITZGERALD MANUFACTURING CO. Torrington, Connecticut

FITZGERALD Gaskets SINCE 1906

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Quantity PRODUCTION of GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS CHATTANOOGA 2, TENNESSEE

Circle 175 on Inquiry Card for more data

(*Continued from page* 122)

FIRESTONE TIRE & RUBBER CO., DEFENSE PRODUCTS DIV., Akron, Ohio
Aircraft tires and tubes, 22,986 ea.—$644,721

FORD MOTOR CO., FORD DIV., Washington, D. C.
Sedans and station wagons, 32 ea.—$60,610

FORD MOTOR CO., FORD INTERNATIONAL GROUP, Jersey City, N. J.
School bus, 2 ea.—$7,015

GENERAL MOTORS CORP., ALLISON DIV., Indianapolis, Ind.
Turbo-prop Engines, 226 ea.—$19,464,200

GENERAL MOTORS CORP., CHEV. MOTOR DIV., Detroit, Mich.
Sedans and Station wagons, 15 sedans, 11 station wagons—$25,727

GENERAL MOTORS CORP., CHEVROLET MOTOR DIV., Detroit, Mich.
Various trucks, 296 ea.—$642,814

GENERAL MOTORS CORP., FOREIGN DISTRIBUTORS DIV., New York, N. Y.
Automobiles & station wagons, station wagons 1 ea., autos 7 ea.—$12,718

GENERAL MOTORS CORP., FOREIGN DISTRIBUTORS DIV., New York, N. Y.
Trucks, 8 ea.—$15,452

GENERAL MOTORS HOLDEN'S LIMITED, Port Melbourne, Victoria, Australia
Automobiles, 20 ea.—$29,928

GENERAL TIRE & RUBBER CO., Akron, Ohio
Various tires and tubes, 11,380 ea.—$585,227

B. F. GOODRICH AVIATION PRODUCTS, DIV. OF B. F. GOODRICH CO., Akron, Ohio
Various tires and tubes, 16,436 ea.—$816,520

GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Various tires and tubes, 43,396 ea.—$1,770,556

HARLEY-DAVIDSON MOTOR CO., Milwaukee, Wis.
Motorcycles, spare parts, 37 ea.—$50,030

HARLEY DAVIDSON SALES & SERVICE, Washington, D. C.
Motorcycles, 11 ea.—$17,947

INTERNATIONAL HARVESTER CO., Washington, D. C.
Bus, 1 ea.—$5,239

INTERNATIONAL HARVESTER CO., Washington, D. C.
Truck Tractors, 50 ea.—$313,050

INTERNATIONAL HARVESTER CO., Washington, D. C.
Various trucks, 12 ea.—$44,468

INTERNATIONAL HARVESTER EXPORT CO., Chicago, Ill.
Truck diesel, 1 ea.—$5,191

LEWIS SHEPARD PRODUCTS, INC., Watertown, Mass.
Fork lift trucks, 44 ea.—$36,995

LINDE COMPANY, DIV. OF UNION CARBIDE CORP., Chicago, Ill.
Automatic Welders, 12 ea.—$27,995

OSHKOSH MOTOR TRUCK, INC., Oshkosh, Wis.
Truck, 1 ea.—$16,404

FRANK G. SCHENUIT RUBBER CO., Baltimore, Md.
Various tires and tubes, 10,925 ea.—$562,425

STUDEBAKER - PACKARD CORP., South Bend, Ind.
Sedans & station wagons, 45 sedans, 7 station wagons—$75,180

U. S. ELECTRICAL TOOL CO., Cincinnati, Ohio
Drill, Electric, Portable, 420 ea.—$29,803

UNITED STATES RUBBER CO., Detroit, Mich.
Various tires and tubes, 15,743 ea.—$956,644

WILLYS MOTORS INC., Toledo, Ohio
Jeeps and spare parts, 10 ea. and 10 sets of spare parts—$18,635

WILLYS MOTORS INC., Toledo, Ohio
Willys station wagons, 14 ea.—$32,133

WILLYS MOTORS INC., Toledo, Ohio
Trucks, 23 ea.—$46,663

DYKEM
STEEL BLUE
Stops Losses
making Dies and
Templates
DYKEM
STEEL BLUE
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue
Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench: metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2301L North 11th St. • St. Louis 6, Mo.

Circle 176 on Inquiry Card for more data

CUT SCRAPER TIME
END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2301-L NORTH 11TH ST., ST. LOUIS 6, MO.

Circle 177 on Inquiry Card for more data

BUY BONDS

Mono·Cord
NO SPLICE RINGS
are better because the principle hazard found in ordinary seal rings and belts has been removed by Western's Mono Cord one-piece construction. In addition, dimensional requirements are maintained, quality controlled, and service vastly improved—all at no extra cost.
Don't use a spliced ring for technical seal applications, but profit from nearly 60 years experience—specify Mono Cord rings by Western.
Write or phone for information, literature or a visit by our sales engineer in your area.
Mono Cord
SINCE 1902
WESTERN RUBBER CO.
GOSHEN 9, INDIANA
Molded and Lathe-Cut Rubber Parts for All Industries

Circle 178 on Inquiry Card for more data

Cluster Gears

(*Continued from page* 104)

Gears are of 5140 chrome alloy steel forgings, isothermally annealed beforer the start of operations to give optimum machinability and weldability. Welding is done manually in Aronson motor-driven positioners, with bores and faces protected against weld spatter adhesion. Parts are preheated at 800 F to avoid formation of martensite, a brittle constituent, during welding. Post-heating at the same temperature for one hour follows welding.

Insofar as possible, machining operations are scheduled after welding to counteract the effects of any misalignment or distortion during welding. Teeth are hobbed and shaved for accurate tooth profile, with the front ends of teeth rounded on the engaging side for easier shifting.

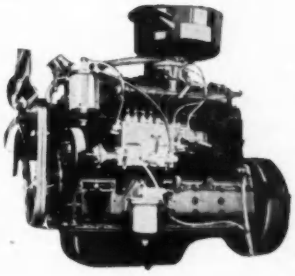
After machining, the cluster gears are given a shallow-case carbonitriding heat treatment in a controlled atmosphere furnace at 1500 F. They are soaked at that temperature for 45 minutes and exposed to ammonia and enriching gases for 30 minutes. Oil quench follows, with washing preceding tempering at 425 F to avoid smoking during tempering. The heat treatment, relatively inexpensive, gives an average case depth of 0.006 to 0.007 in., with surface hardness of 50 to 60 Rc. Steel is purchased to rigid hardenability specifications, as well as chemistry, so that a core hardness of 50 Rc is obtained on a section at the center line of a typical gear tooth after heat treatment. ■

BOOKS...

METALLIZING IN PLASTICS, *by Harold Narcus, published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $5.50.* Complete details for carrying out every commercial metallizing process for plastics or other non-conductors are presented. This is the first treatment of the subject to deal with actual production procedures, formulations and techniques for all known metallizing methods. These include the copper film process (developed by the author), the deposition of "electroless" nickel coating, a review of the new molded conductive plastics, "gas" plating, and the deposition of thick evaporated films and many others. Numerous illustrations show the latest equipment being used in the newer processes.

ISUZU DIESEL MOTORS

TIGHTEN HIDDEN COST NOW



ISUZU DIESEL ENGINES...

have been internationally commended for superb achievements in economy on long hauls and multi-stop duties: ISUZU engineers have perfected the dynamics of Diesel power as a consequence to Japan's physical irregularity and paucity of natural resources. Dependable as her international reputation are the products of Japan's oldest and largest Diesel manufacturer, ISUZU.

for further information, write to:

ISUZU Motor Representatives
649 South Olive Street
Los Angeles 14, Calif.

ISUZU Motor Co., Ltd.
Export dep't (AI-1)
2691 Oi-sakashita-cho
Shinagawa-ku, Tokyo, Japan
Cable address ISUZU TOKYO

ISUZU DIESEL

ISUZU MOTOR CO., LTD.

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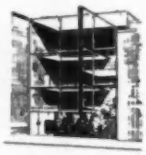
A CHILTON  PUBLICATION

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By C. J. Kelly
ASSISTANT EDITOR

Boring Bars 1

Catalog number D-520-A explains the Davis boring bar tooling system and lists the complete line of bars and related tools and accessories. Illustrations, line drawings, cut-aways and charts are included to complete the necessary information needed in selecting a tool for a specific application. *Giddings & Lewis Machine Tool Co.*

Automatic Machines 2

Nine automatic machines for production product finishing are illustrated and described in a brochure made available by the *Conforming Matrix Corp.*

Friction Materials 3

A new 80 page catalog lists braking and other friction materials for various off-the-road equipment. Organic and sintered metallic materials are included for every type of clutch and brake application. Manufacturers' index facilitates quick location of proper specifications for parts on all makes of equipment. *American Brake Shoe Co.*

Tool Tips 4

The December issue of Ex-Cell-O Tool Tips is now available. This copy discusses various machining operations, contains illustrations, and gives detailed information on manufacturing applications. *Ex-Cell-O Corp.*

Paint Systems 5

Availability of a new 8 page, illustrated catalog describing centrifugal type electrostatic paint spray systems and related equipment has been announced. Called bulletin 100, this publication discusses the functions of the equipment and explains the limitations of conventional equipment. *Lonic Electrostatic Corp.*

Transmission 6

A four page bulletin describes a 515 lb aluminum, nine speed transmission. Photographs show the entire unit in its aluminum casing and the selector lever and range control button in the driver's cab. A chart is employed to illustrate positioning of the gear shift lever. The bulletin has been designated 610-ED. *The Clark Equipment Co.*

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Diamond Abrasives 7

Bulletin 7, which is illustrated with comparative photomicro graphs of the various diamond grits, carefully and completely reviews the latest advances and techniques in the uses of diamond abrasives. Comparisons are made between Man-Made diamonds and Selected Natural Diamonds. *Diamond Tool Research Co., Inc.*

Magnetic Control 8

An organizer board that uses magnetic cardholders to designate the whereabouts of salesmen, stock, manufacturing operations, etc., is discussed in a 10 page folder. It shows how the boards are used and gives various typical applications. *Methods Research Corp.*

Air Control Valves 9

A handy, quick-reference, specification catalog presenting a new tested design of mechanically and manually operated air control valves has been issued. The catalog covers ¼ in. NPT, 2-position balanced spool valves normally closed or normally open 2 way, normally closed or normally open 3 way and 4 way styles. An unusual three page spread presents all **model numbers, specifications and** operators in one easy to read chart. Valve operator availabilities cataloged include knob operator, lever **operator, clevis, roller cam, over**riding roller cam, foot pedal, treadle and air operators. Listed are standard accessories . . . mounting foot, detent section, return spring and sub-base mounting. *Hoffman Valves, Inc.*

Executive Data 10

A new technique in cost controls designed to protect profit margins is explained in a booklet prepared for top executives. Entitled "The Controlled Overhead Plan," the booklet describes the three main areas of cost "erosion" which eat into profits. They are: insufficient use of existing personnel; over-staffing; and costly space, inadequately utilized. The booklet explains how the problem can be solved by controlling and decreasing major operating costs, increasing sales and by creating new profit making opportunities. First step in the plan is an analysis of all departments as to job costs and personnel requirements. *ManPower, Inc.*

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Gear Finishers 11

Six-page bulletin 999-60 describes abrasive hard gear finishers and how they are used for final surface conditioning of gear teeth after hardening. In addition to giving complete physical specifications on the machines, the bulletin discusses various uses, how to produce crowns and tapers, cutting fluids, new resins for hones, automatic and manual hone dressing, and automatic loading and unloading. *Michigan Tool Co.*

Screw and Spline 12

Titled "Ball Bearing Screw and Spline Operation," a 1961 engineering data book shows basic principles, types, and applications of ball bearing screws and splines. Also included is data on design, sample problems, lubrication information, size ranges, critical speeds, finishes available, and mounting methods. The 24 page book is said to be a valuable aid in solving actuation problems. *Saginaw Steering Gear Div., General Motors Corp.*

Investment Castings 13

A 20 page comprehensive report on the characteristics, metallurgy, markets and future trends of the American investment casting industry is available. Many important segments of this industry are discussed along with trends and production pattern charts. It is divided into nine sections for quick reference. *WaiMet Alloys Co.*

Trolley Units 14

Consisting of 40 pages, bulletin number 90 catalogues steel-enclosed trolley busways and their electrification. Included are new heavy-duty trolleys, transfer trolleys, and an enlarged line of standardized equipment which is rated at 60 amperes continuous service and 90 amperes intermittent service. This illustrated bulletin is available from *Feedrail Corp.*

Furnaces 15

Pictures and illustrations in this 8 page bulletin show hot-wall vertical retort vacuum furnaces, horizontal retort vacuum furnaces, cold-wall vacuum furnaces and a vacuum-atmosphere retort tube for research and pilot plant use. *Lindberg Engineering Co.*

Load Measuring 16

Two electronic precision instruments designed to safeguard dies and presses during production runs, are described and illustrated in a new product report issued by the *Niagara Machine and Tool Works.*

Fluid Power Valves 17

Engineering data for the new Ross Headline fluid power valve in 25 types is covered in an 8 page illustrated bulletin. Given are specifications, features, C_v factors and response time of these poppet type control units. Cut-away photos and charts are included to complete the information. *Ross Operating Valve Co.*

Indexing Tables 18

Catalog U-100 presents complete technical specifications and illustrates typical applications for high-precision indexing tables. Data for the 7, 12 and 24 in. models is included along with a description of the push-button models for automatic and semi-automatic angular indexing. *The AA Gage Co.*

Powder Metallurgy 19

The latest Powder Metallurgy Quarterly, a publication of the Metal Powder Industries Federation, and the American Powder Metallurgy Institute has been released. It features case histories of a variety of small, complex powder metallurgy parts, illustrating the role of this process in miniaturization. News of the industry and a calendar of meetings of local sections of the APMI are included. *Metal Powder Industries Federation.*

Welding Torches 20

Operating data, specifications, and design features for welding torches are covered in an eight page booklet. Charts, illustrations and complete ordering data are also given. *Linde Co., a Div. of Union Carbide Corp.*

Die Alloy 21

Bulletin G-55 describes a new hard bronze die alloy for drawing, forming and bending stainless and clean mild steels. *Ampco Metal, Inc.*

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Universal Joints 22

This 218 page, 8½ by 10½ in. book covers all specification information of automotive and industrial universal joints. With numerous illustrations, line drawings, charts and technical data it is a most complete reference. *Borg-Warner Corp.*

V-Belts 23

Design features and performance advantages of all R/M V-belts are detailed in a new 8 page bulletin which includes Condor and FHP belts. Both of which offer special designs for heavy and light duty, short and long center applications. In addition to ordering information and specifications, the new bulletin includes graphically illustrated sections on the comparative advantages of straight sidewall construction in V-belts. Bulletin M-201 is available from the *Manhattan Rubber Div., Raybestos-Manhattan, Inc.*

Flat-Belt Pulleys 24

Bulletin 22103 covers a complete line of flat-belt pulleys in face widths from 2½ to 12 in. and OD from 4 to 36 in. Both straight and crown types are discussed. The four pages include charts, illustrations and specification information for the line. *T. B. Wood's Sons Co.*

Test Standards 25

Pressure test standards are discussed in an informative document on Burdon tube gauges for use as test standards in the calibration of other instruments and in laboratory analysis. Numerous illustrations, specifications and construction features are included. *Heise Burdon Tube Co.*

Pressure Tanks 26

A new 4 page brochure describes a line of ASME and standard industrial tanks and vessels. Models, engineering drawings and representative dimensional tables of ASME air pressure and expansion-compression tanks are shown, plus illustrations of typical standard industrial tanks and vessels and heavy duty gasoline and fuel tanks. *Industrial Tank Div., Cutler Metal Products Co.*

Aluminum Booklet

A 104-page booklet, entitled Machining Kaiser Aluminum with Automatic Screw Machines offers latest field data on this subject. Extensive new information is correlated with text of original booklet to show advancements made in this important field of machining. Please request on company letterhead to: Technical Publication Dept., Kaiser Center, Oakland, Calif.

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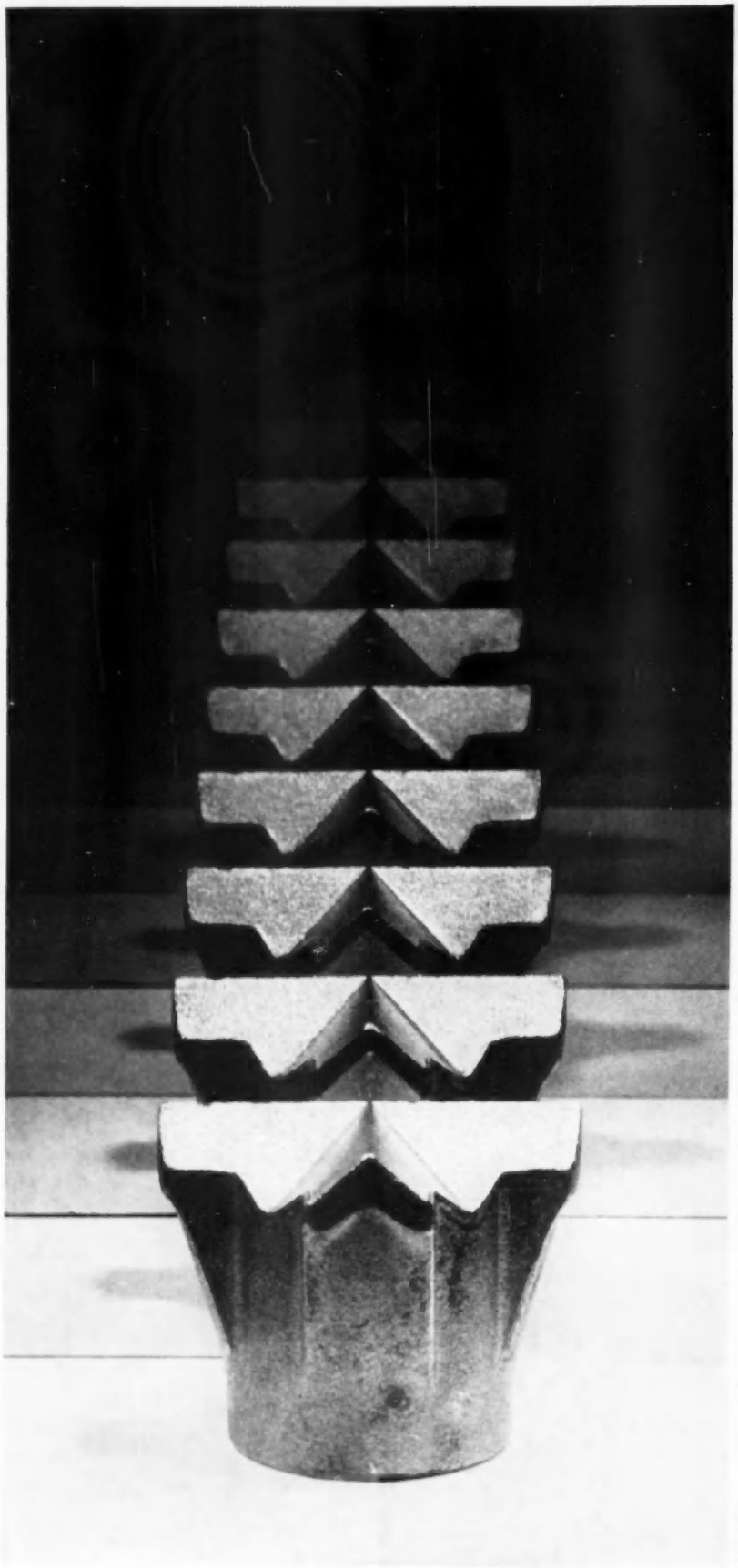

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